EAST AFRICAN DAIRY DEVELOPMENT PROJECT

REPORT OF PARTICIPATORY RURAL APPRAISAL BASELINE SURVEY OF SMALLHOLDER DAIRY FARMERS IN NYANGATARE, GATSIBO, AND RWAMAGANA DISTRICTS OF RWANDA

PRA Team Members:
Dr. Manzi Maximillian **(Coordinator)**
Mr. Rukundo Emannuel
Mr. Mupenzi Mutimura
Mr. Aman Placid
Mr. Jean Paul Munyaneza
Mr. Gafishi Martin

ILRI
INTERNATIONAL LIVESTOCK RESEARCH INSTITUTE

Agricultural Research Institute of Rwanda (ISAR)

International Livestock Research Institute (ILRI)
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Acronyms and Abbreviations

AI	Artificial Insemination
EADDP	East African Dairy Development Project
HPI	Heifer Project International
ILRI	International Livestock Research Institute
MINAGRI	Ministry of Agriculture and Animal Resources
PADEBL	Projet d'Appui au Developpement de l'Elevage du Bovin Laitier
PRA	Participatory Rural Appraisal
RARDA	Rwanda Animal Resource Development Authority
RSSP	Rural Sector Support Project
UCRIDP	Umutara Community Resource and Infrastructure Development Project
TNS	Techno Serve

INTRODUCTION

The Dairy Cattle Sector in Rwanda: An overview

Rwanda's cattle population is estimated at 1,006,572, with more than 50% of the population concentrated in North East of the country. According to the Ministry of Agriculture (MINAGRI), out of this population, 86% are local breeds, 13% are crosses and 1% grade cattle. The production systems are essentially of the traditional type. The annual milk production estimates at 350 million liters (EADDP, 2010). Rwanda's milk intake is 12 litres per person, which falls short of FAO's recommended intake of 220 litres per person. The country has continued to rely on milk importation to help bridge this deficit.

Rwanda has longstanding cattle keeping tradition in which stockbreeding has always played very important economic and social roles in its society. Currently, livestock production contributes approximately 6% of the total GDP and 30% of Rwanda's agriculture GDP. Despite its importance at both household and national levels, the country's livestock sector is characterized by low productivity due to:

- poor animal feeding regime
- weak genetic performances of local cow breeds
- lack of a conservation system (of cooling system) which led to the deterioration of animal products
- lack of an adequate extension system
- lack of well organized marketing system for animal products
- difficulty of access to agricultural loans
- prevalence of epizootic and enzootic diseases

Deliberate and sustained initiatives to mitigate these factors will contribute to a five-fold increase in milk production and in the value of dairy farming as envisioned in vision 2020. Dairy farming is one of the most cost-effective methods of converting scarce land and scanty feed resources into high quality protein-rich food resources. Although the cross-breeds are better adapted to local conditions, under improved management practices, purebreds have a higher potential for increased productivity. In this regard, the government of Rwanda through MINAGRI in partnership with her development partners have began initiatives to address this need.

The East African Diary Development Project

The East African Dairy Development (EADD) partnership brings five experienced organizations together to test a package of complementary interventions that together address the noted deficit areas. The partners—Heifer International (Heifer), the International Livestock Research Institute (ILRI), TechnoServe (TNS), ABS TCM and ICRAF—believe existing knowledge and technologies can be employed as a business system that helps farmers utilize their livestock assets to produce greater income. The partnership proposes to work in specific districts of three East African countries: Kenya, Rwanda and Uganda (see Figure 1).

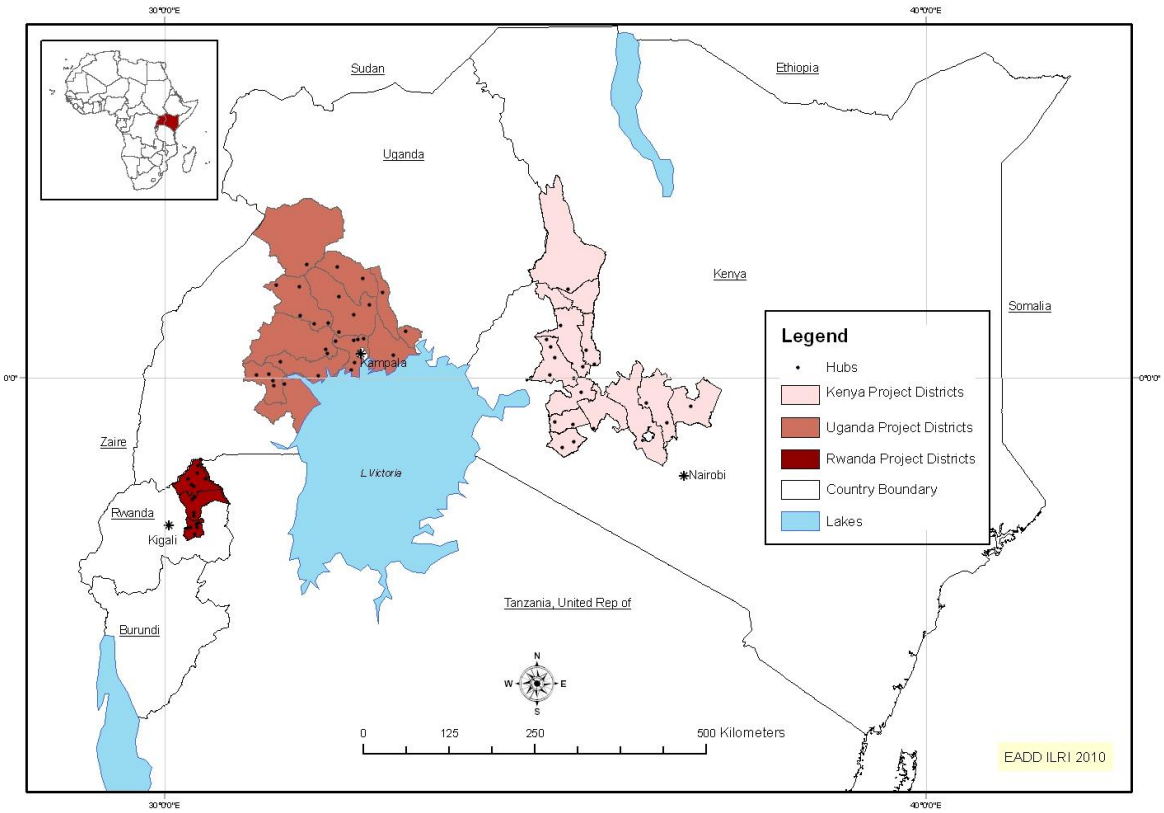

Figure 1: EADD Project sites

The objective of this partnership is to help move smallholder farmers out of poverty by improving dairy production and market access through increasing the volume of milk produced; improving milk quality and reducing loss through spoilage; providing access to production inputs through business delivery services; improving market-access by developing local hubs of business development services and chilling plants that facilitate market access; linking producers to formal markets through processors; and increasing producers' benefit from traditional markets.

To collect evidence of the existence smallholder dairy farmer circumstances, the local resource base, challenges and opportunities for investment in dairy production, a qualitative baseline survey in the Eastern Province of Rwanda was conducted using a Participatory Rural Appraisal (PRA) tools. The survey was conducted in September 2008 by a PRA team composed of staff from the International Livestock Research Institute (ILRI) in collaboration with the Agricultural Institute of Rwanda (ISAR). The goal was to identify constraints and suggest interventions geared towards promoting the sustainable development of dairy production of study sites. Two villages in each of the three districts selected formed the focus of the PRA surveys. The villages include Mbare and Kajumo villages in Nyagatare District, Kabarore and Bihinga villages in Gatsibo District, and Mugusha and Akanogo villages in Rwamagana District (see figure 2).

METHODOLOGY

Preparatory meetings were held with the dairy sector and district administrators. The goal of this exercise was to explain the objectives of the project and the study, expected outputs, as well as the use and modalities of participatory rural appraisal (PRA) tools.

Prior arrangements were made before the PRA exercise in each village. These included awareness creation about the EADD project, its objectives and activities to the selected community members. Appropriate mobilization of participants for the PRA meetings was done in good time. This period was also used for setting the dates for each village and requesting representation of all representative socio-economic groups and dairy sector actors from the village. The initial meetings also served as opportunities for team building and selection of potential study sites and PRA representatives.

Selection of PRA sites was made on the basis of their accessibility, infrastructure and presence of active dairy cooperative. The criteria for selecting PRA representatives included gender (both men and women were represented), age (participants had to be in the range of 18 – 65 years), location within the village (had to be resident in that village), knowledge and interest in dairy farming (have and show interest in dairy cattle keeping).

The PRA tools used included drawing the village resource map, wealth ranking, livelihood analysis, analysis of constraints and opportunities in dairy farming, innovation actor analysis, and livestock breeding and feeding. The tools had the following specific objectives

a) Resource Map: to develop spatial profiles by mapping the natural resources, infrastructures, social services and land use systems within the village with respect to dairying opportunities and challenges.
b) Wealth ranking: to determine the distribution of wealth within the community based on assets owned and income and the links between livestock ownership and wellbeing, including the critical herd size.
c) Livelihood Analysis: to identify important livelihood activities and income sources (on farm, off-farm, and non-farm) and their recent trends.
d) Innovation Actor Analysis: to identify and document the status of innovations in dairy industry; major actors and their roles, activities; attitudes and practices; and understand patterns and effects of interactions
e) Livestock breeding and feeding: to identify important traits of dairy cattle preferred and assess breeding services and strategies linked to them; o capture the general problems associated with forage production

The qualitative baseline survey generated information that was used to assess the current status of farmers and main actors involved, constraints faced in the dairy development, and the identification of possible potential intervention strategies.

In all the study centres, communication between the participants and PRA team was very good. This was demonstrated by the openness that farmers (both men and women) discussed and participated in various PRA exercises. Their eagerness also demonstrated their strong interest in dairy farming.

Summary of findings, conclusions and recommendations

Summary and Conclusions

Dairying and livestock products are the most sources of livelihoods and income, whose potential has not been fully maximised. Key features of this situation include:

Resource Profile

Water in the appraised area is available but limited during dry seasons when farmers are forced to make long distances. There are no communal rangelands. Soils are fertile but only used for subsistence farming. There are neither irrigation schemes nor mineral resources.

Community Livelihood, Land-use system and income profiles

In order of importance, the major sources of livelihoods include livestock keeping, crop farming, artisan and business. Cattle are the predominant stock kept, and to a lesser extent goats and chicken. Soils are fertile for various crops but cash crops are not grown. Vegetables, fruits and beans are the predominant crops cultivated. Farmers are involved in handcrafts but there is no market for these products. A milk cooling facility is only available in Mbare.

Wealth Ranking

On the basis of land size, number of cattle, off-farm income housing standards and education, our major categories of wealth were identified. Rich and moderately rich categories were dominated by men, while the women dominated in the remaining categories. Rich and moderately rich had stronger interest in dairy than farmers in other categories.

Innovations and Actor Linkages

In the study centres, the innovations identified include access to water by farmers and its availability on farms, veterinary services, use of A.I. and improved bulls. The key actors include farmers (mainly in the wealthy to moderately wealthy category), Projet d'Appui au Developpement de l'Elevage du Bovin Laitier (PADBEL), Umutara Community Resource and Infrastructure Development Project (UCRIDP). A.I technicians and veterinarians in most appraised areas were considered non-functional, while accessing bank loans was noted to be difficult.

Breeds and breeding

Purchase and inheritance is the main mode of breed acquisition. Government policy of "one cow one family" by the year 2015 is another source of new breeds. The local Ankole breed is the common breed kept because the exotic breeds are expensive to acquire and they require more costly inputs. Farmers still used crossed bulls and some of unknown pedigree leading to downgrading of the dairy animals. Farmers are familiar with A.I but the services are poor, characterised by few technicians and long distances they have to cover to reach the farmers.

Feeds and Forage

Natural grass is the most common source of animal feed, and Napier grass the most common forage. Feeds and forage sufficiency is constrained by lack of quality forage seeds, prolonged dry seasons, land scarcity and lack of knowledge in forage conservation techniques. Farmers cope by hiring plots from farmers who do not have cattle, and by use of crop residues.

Gender and Dairy Farming

It is evident that the major activities that of dairying, including acquisition of breeds, management decisions, disposal of products were dominated by men. Women and children are more involved in cleaning cow-sheds and feeding of young calves.

Recommendations

It is noted that farmers have a strong interest in dairying. The community is aware of decreasing land and population increase, which necessitates improved and sustainable means of production. The farmers are aware that increasing production by genetically improving local breeds rather than increasing their numbers will greatly improve their production systems. However because of the higher costs of managing improved breeds, it is critical that the dairy industry in the appraised area be supported by enhancing the efficiency of Artificial Insemination, improving animal health services, farmer training, and improved animal feeding regimes.

FIELD FINDINGS

PRA REPORT FOR MBARE SITE, NYAGATARE DISTRICT, RWANDA

Introduction

The International Livestock Research Institute (ILRI) in collaboration with the Agricultural Research Institute of Rwanda (ISAR) conducted a PRA on 11th and 13th September in Mbare hub. Farmers who participated were mainly from the local farmers' cooperative society, and a few non members who included local leaders.

Prior to embarking on the study, a team of research scientists from ISAR participated in a training workshop which focused on Participatory Rural Appraisal (PRA) tools, modalities of conducting PRA, team building, and the selection of the potential study site.

The initial contacts in the potential sites were made through the sector administrator in Karangazi who arranged a meeting to meet the cell leader. In the course of this meeting, the objectives of the study and expected outputs were clearly defined. We further agreed on the criteria for selection of the PRA representatives and appraisal sites. These sites were selected on the basis of their accessibility, infrastructure and presence of an active dairy cooperative.

Karangazi is located in the lowland agricultural zone in the eastern part of Rwanda along the Kayonza–Kagitumba Highway. It is about 40km to the Rwanda–Uganda boarder, and 15km from Nyagatare town. The local communities in this area are mainly cattle keepers. The sector is located

at an altitude of 1,513.5 m a.s.l, with annual temperature varying between 20.3oC and 21oC. The rainfall received is bimodal, with short rains (season A) falling between September and December and long rains (season B) extending from March through May.

Mbare site is located in Nyagatare District, Karangazi sector, Mbare cell (see Table 1). The PRA sites (two sites) that were selected in this site are Mbare Village which is located near the Mbare milk collection centre, and Kajumo village which is located about 10 km from the Mbare milk collection centre.

The PRA representatives were selected based on gender (both men and women represented), age (participants had to be at least 18 years and not older than 65 years old. The representatives had to residents of the village, knowledgeable and with keen interest in dairy cattle keeping. Participants' turn up was impressive, with women equally represented. The group was composed of mainly livestock keepers (some who also raised crops in addition to cattle keeping) and local leaders.

Six PRA tools were used. These were Resource mapping, Wealth Ranking, Livelihood Analysis, Constraints and Opportunities in Dairying, Innovation Actor Analysis, and Livestock Breeding and Feeding. The participants engaged freely in open discussions, sharing information freely. With these tools the objectives of this qualitative baseline survey were achieved, inter alia, an assessment of the current status of farmers and the main actors involved, constraints faced in the dairy development, and the identification of potential interventions in the selected site.

Communication between the participants and PRA team was very good. This was showed by the openness that farmers expressed their views, where both men and women were involved in the discussion. This can be attributed to the keen interest that the participants have in dairy farming

Except for transport constraints due to poor roods, the exercise did not face any challenges that would have affected our findings.

For future exercise one has to bear in mind that farmers have got stronger interest in dairying by the community who are cognisant of the decreasing land due to population increase. If assisted, the community have a vision of increasing production, which they reckon will be possible through improved local breeds rather than increasing their numbers.

Table 1: Mbare *PRA village workshop profile information*

Country: Rwanda			
District	Nyagatare		
Other administrative unit	Karangazi		
Name of Village	Mbare village, Kajumo village		
Date of village workshop	12 and 13/09/08	Duration of workshop	one day
Venue for the workshop	Mbare milk collection centre, Church.	Language of workshop	Kinyarwanda.
Number of participants (Mbare village)	Female:9 Male:14	Number of participants (Kajumo village)	Female: 11 Male: 13

Names of facilitators	Mr. Rukundo Emannuel, Mr. Mupenzi Mutimura, Dr. Manzi Maximillian (Coordinator)		
Names of note takers	Aman Placid, Gafishi Martin, Jean Paul Munyaneza		
Names of observers	Kanzaire Claire, Kalisa Prosper		
Special conditions (weather, local activities, etc)	None		

Mbare Village: Resource Mapping

After initial guidance from the PRA team, participants from Mbare Village and Kajumo Village drew the resource maps of their areas. The key features identified include roads, milk collection centre (with milk cooler), Valley dam, electricity, cattle market and settlements (Figure 2).

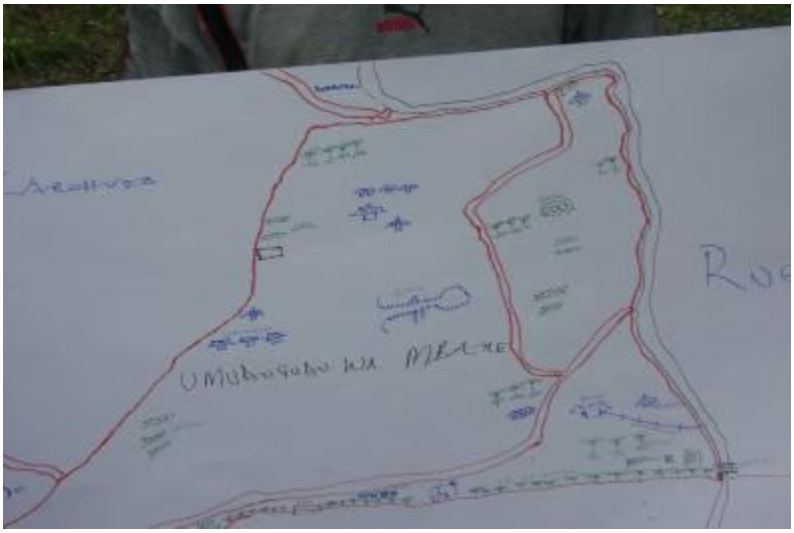

Figure 2: Mbare Village Resource Map

The detailed findings of the community sketch map are detailed in the template for analysis for area resource mapping (Table 2)

Table 2: Mbare: community resource profile

MAPPING ISSUES	DETAILED INFORMATION
Natural Resources	
Water	Water pans and swamp which collect runoff water from rain. However during prolonged dry periods water dries up and farmers are forced to move long distances approximately 2 km to where there is a communal valley dam and which is 3km from Kajumo village. One borehole available but not adequate. No borehole in Kajumo village.
Crop fields	Fewer crop fields in Mbare compared to Kajumo village. The main crops grown in the area are food crops, including cassava, maize,

	beans and bananas.
Rangelands	Rangelands owned individually. Some farmers have no land thus keep wandering animals
Gardens	Many gardens in the village: crops mainly grown are vegetable, fruits trees and beans.
Irrigation schemes	No Irrigation schemes
Mines	No mines. There is a hill of stones in Mbare which are not exploited probably because of their poor quality.
Forests	Afforestation in progress. Previously, Acacia the only tree species visible
Infrastructure	
Roads	There is one good main road passing in the village and other two roads across Mbare village. No such road reported in Kajumo village.
Settlements	Areas for housing are separate from areas for livestock or crop production which is government policy. This type of settlement is locally known as 'umudugudu'. However, it was observed in both villages that some live in the umudugudu and others especially cattle farmer prefer to live on their farms with their animals.
Commodity markets	No commodity markets. The nearest market is about 2km from the two villages.
Milk sale point (informal or cooperative/ self-help group)	Sold at Milk collection centre belonging to the local farmer's cooperative known as TERIMBERE MWOROZI. Construction was supported by PADEBL (government project), but farmers from Kajumo village make longer distance as compared to those from Mbare.
Milk cooler/ processor	There is a milk cooler at the milk collection centre
Dip tank/cattle crush	Cattle crush constructed using wooden poles; other farmers spray their cattle confined in bomas.
Vet Pharmacy	Vet pharmacy present at the milk collection centre belonging to farmers' cooperative.
Stock feed sources	Only salt for cattle; also available at the milk collection centre
Cattle market	Livestock (cattle) market available in Mbare but absent in Kajumo village.
Electricity	Milk collection centre has been recently connected but near-by house holds are not yet connected.
Social services	
Health	No health centre in both villages; people to be attended to at the near by Health centre approximately 1 km from the site.
Schools	One primary school that is in poor condition and not currently used. There is a better primary school in the nearby village, which is also used by Kajumo village
Church	There are churches in both villages
Local administration	local administrative at a village level
Traditional Authorities	No traditional authorities
Extension offices	Located at the sector which is approximately 10km from this village

NGO offices	Offices are either located in Nyagatare or Kigali
Government projects	Offices Located in Nyagatare: Umutara Community Resource and Infrastructure Development Project (UCRIDP), PADEBL in Kigali, and EADD in Nyagatare.
Land use system	
Croplands and use of crop residues	There are croplands but are scarce, use of crop residues is limited (only maize stover and banana peelings)
Communal rangelands	Ranges are individually owned
Grazing reserves	None
Seasonal herd movements	No movement. Farmers cope with drought by hiring of others plots or some use Napier grass.
Farms	Farms owned individually

Economic activity and Land use system

The most important economic activities in the area include Livestock and crop farming. Over 70 % of land in the villages is used for cattle grazing. Crops farming and settlement occupies the remaining. Tree planting is mainly done alongside the road.

Relationship between the mapped items, challenges and opportunities

It is evident from the map that:
Farmers are faced with inadequate water. Fewer water pans and one communal water tap are insufficient for the village.
Extension services offices are located away from the villages. The result is that A.I technicians hardly reach the farmers. When they do, they hardly inseminate cows on heat on time. Vets can not also treat animals on time.
Stock feed sources are found far from the village. One can only buy them from Nyagatare at cooperative head quarters.
Good network of roads makes the place easily accessible.
Presence of milk cooling facility in the village helps in reducing milk spoilage for farmers and their neighbours (Kajumo and Karohoza villages).
Presence of electricity in village but only milk collection centre is connected; farmers living in grouped settlements (umudugudu) will take advantage of this and extend power line to their homes.
Presence of trading centre ½ km from the village.

Mbare: Wealth Ranking Analysis

Wealth criteria's in order of their importance

Farmers from Mbare identified the major wealth indicators as access to or ownership of land, livestock ownership, the quantity of milk produced, food sufficiency, ability to participate in

trades/off-farm income generating activities, type of house, and ability to meet basic needs (e.g., school fees).

Wealth Categories

On the basis of the above indicators four (4) wealth categories were identified in the community. These are: Very rich (Umukire), Rich (Umukungu) Poor (Umukene) and Very poor (Umutindi). The wealth assessment of the different categories is summarised in Table 3.

Importance of livestock in relation to other wealth criteria

The livestock ranked second as regards to other wealth criteria's because over 90% of the communities in this Village are cattle keepers. People in this area are known to have been for long time keeping cattle (pastoralists) and this explains why land ranked first because it assumes more importance as bigger land allows them to keep higher numbers of cattle and livestock and livestock products are of great importance to the diet and source of income to this community. Crop farming is newly coming practice in the area and thus making it ranked third

Table 3: Mbare Village: Major criteria/assets for different wealth categories

MAJOR ASSETS	WEALTH CATEGORY			
	RICH	MODERATE RICH	MODERATE POOR	VERY POOR
Land	Owns about 25 ha	Owns about 10ha	Owns about 5ha	Owns 2ha
Cattle	Owns 40 (crosses): Ankole X Friesian or Ankole X Jersey	Keep 10 Ankole	Keeps 5 Ankole	Owns no cattle, sometimes only able to keep very few small stock
Crops (in general different cereals and legumes)	3 tones (enough food and surplus for sale)	2 tones	600 kgs. 0nly for home consumption	100kgs
Off-farm income	5million Rwandan francs = 9,200 USD in the bank.	500 000 frw =915 USD in the bank	60 000frw	10 000frw has no bank account.
Housing standard	Constructed using bricks, roofed with iron sheets, cement (modern house)	Constructed using Mud blocks, roofed with iron sheets, cement	Made of mud blocks and thatched with iron sheets	Mud blocks and by local administration to get iron sheets because of government policy

				discouraging grass thatched houses.
Education for children	Educated up to university level	university level	secondary level	primary level (because universal free primary education otherwise they can not afford
% households in each category				
Difference by - gender - and age	90% are men 40-60 years old	80% are men 30-55 years old	80% are women 35-80 years old	80% are women 35-80 years old
Differences by milking and marketing orientation	Produce 30 litters per day	5 litters	3 little	Sells labour to purchase milk

Farmers' preference for dairying across the wealth categories

All farmers showed grater interest in dairy farming because it is the main income generating activity. In addition, rich and moderately rich farmers have tested the benefits of dairying as a result of more investments. The poor are also interested but are afraid of keeping improved animals because of their high costs of management which they may not afford. The farmers say that "we are striving to change the indigenous less producing cows to high producing exotic breeds, but there still a long way to go" due lack of adequate A.I. technicians, and also that these technicians show preference to their friends whenever they are called upon. Farmers also wished that because crossbreeding programme takes time to realize the benefits, they need to be helped in getting loans from the bank toe enable them purchase improved breeds. This was the wish of farmers in the rich category.

Traditional livestock production system is changing focus from the traditional towards commercial dairy farming, and selling of milk is now one of the major sources of household income.

Plate 1: *Milk delivery at a milk collection centre*

Gender and other cross-cutting issues

In terms of resource access and control between men and women, though both men and women were found to have access to almost all household assets, it was clearly evident that even though gender balance existed still final decision rested with the men. It was also seen that women do participate in livestock activities but their role was less compared to men, as most women mainly concentrate on domestic activities. Female-headed households were also present but very few in this area.

Summary

- Four (4) identified wealth categories were: Rich, moderately rich, moderately poor and very poor.
- Major criteria's for wealth ranking, in order of their importance, include: land, cattle keeping, crop production, off-farm income, housing standard and education of children.
- Rich and moderately rich categories were dominated by men consisting of 90 % and 80% respectively of the total in the category; while the women dominated in the remaining categories.
- Rich and moderately rich had stronger interest in livestock than farmers in other categories.
- Land ranked first as the major asset considered in identification of wealth categories.

Mbare: Community livelihoods analysis

Main source of livelihoods in the village

The main sources of livelihoods in order of importance are livestock keeping, crop farming, artisan and business. Livestock keeping is the main activity and farmers are basically pastoralists. This

explains why livestock ranks first in its contribution to livelihoods and to cash income. It is becoming more important especially with the introduction of genetically improved cattle breeds. Crops ranks second because the yield is good due to fertile soils (the area has only been settled over the past 14 years as it used to be part of Akagera National park). However farmers complained that they lack quality seeds, lack storage facilities and are ignorant due to lack of exposure. Farmers involved in handcrafts said they were becoming discouraged due lack of market.

Plate 2: Mbare: transporting cattle to abattoirs

Main sources of cash income

The main sources of income for members of this community are from sales of livestock and livestock products, mainly milk and butter especially in wet season when milk is in surplus. It is further noted that farmers in this are mainly keep cattle. Goats or chicken were viewed as the preoccupation of women or children and the income generated from these small stocks is used for procurement of food or other minor household requirements. There is a relationship between sources of income and livelihoods. For example, where livestock was ranked first as source of livelihood it was ranked first as source of cash income. This also applied to other sources of livelihoods.

Role of Dairying in community livelihoods and cash incomes

The fact that farmers ranked livestock first in terms of livelihood and cash income is clear indication of the role of livestock in this community. When asked about the role of dairy farming, one farmer stated that 'to us cattle is everything', and milk produced is for both home consumption and for sale. Farmers in this area benefit from the presence of the milk cooling facility. Farmers with relatively high volumes of milk (especially from crossbreeds) sell it directly to the milk collection centre. Others farmers deliver their milk through transporters who collect milk from different households and deliver it the collection centre. The transporters are then paid at the end of the

month. In addition to income generated from milk sales, farmers also get income from sale of bulls, butter (especially in wet season when the milk produced exceeds capacity of the current cooling facility) and hides. Farmers who grow crops also use manure in their fields, although this is not common because the land is still naturally fertile.
The income generated from sales of livestock and livestock products (mainly milk) is chiefly spent on school fees for children, purchase of more livestock, construction of houses, payment of hired labour, and purchase of assets such as bicycles, motorcycles and land.

Table 4: Mbare: Livelihood activities ranking and analysis matrix

Current sources of livelihoods	Contribution to livelihoods (Rank in order of importance)	Contribution to cash income (1=very important, 2=somehow important, 3=not important)	Trends (1=becoming more important 2=less important, 3=new activity)	Differences in terms of gender and age
1. Livestock	Livestock	1	1	Both men and women rear livestock
2. crop	Crop production	2	1	Cropping is done by women and men
3. Business	Business	3	3	Both men and women.
4. Artisan	Artisan	3	3	Women do weaving (kuboha uduseke)

Trends in the relative importance of livelihoods and cash income

Farmers note that cattle have been very important to them and continue to be important. They observe that they used to keep large numbers of cattle (in hundreds) just for prestige. For instance, a situation was presented where an individual kept more than a hundred cows but still lived in a grass thatched house. Such a farmer did not bother to access markets for livestock products (milk and butter); instead the products were exchanged for other food items. Currently, farmers are being sensitized by extension agents on the need for individual/private feeding regimes as opposed to communal grazing, and on the need to reduce the number of animals to balance with the size of their farms. Further majority of farmers in this site are members of a local cooperative (Duterimbere Cooperative Society), which helps farmers in marketing their products. The farmers' mentality has changed in recognition of the benefits they are getting through improved dairy management practices. Farmers are being encouraged to transform their indigenous cattle through crossbreeding with exotic breed. They are optimistic that cattle will continue to remain a major source of income, especially for farmers in Mbare.

Another change observed is the increase in the importance of crop production as a source of livelihood and cash income. The trend is that crop production in this site (which is predominantly, cattle keeping) is on the rise. However, land left for crop farming is smaller compared to that for cattle farming. This is probably because the crops grown are for home consumption. According to the farmers, business and artisan trades are new activities and their contribution as source of livelihoods and cash income is still not significant.

Gender and other crosscutting issues in livelihoods

Generally, men and women participate in all activities of livelihoods and cash income, and have equal access to almost all household assets. Women are very happy with the balance because previously, they used to be overwhelmed by activities and had no hand in decision making. One woman notes 'in previous times decision making for instance taking a cow to market rested with the men but presently we have to agree on use of income generated from cattle sales'.

Plate 3: PRA participants in discussion on Livelihoods

Summary

Main sources of livelihood and income in order of their importance are: livestock keeping, crop farming, artisan and business.
Predominantly livestock kept were cattle followed by goats and chicken.
Only food crops are grown in the area
Soils are fertile (good for crop production)
Farmers involved in handcrafts lack market for their products
Cooling facility present in the area but in wet season production exceeds capacity of the available cooling facility.
Farmers are slowly changing from traditional to modern production system.

Mbare: Constraints and Opportunities in Dairy Farming

The main problems/ constraints mentioned in dairy farming in Mbare hub include insufficient water, land scarcity, prolonged dry season, animal diseases and inadequate milk market. The causes/

effects, suggested coping strategies to solve the main constraints, and opportunities/ suggested solutions are illustrated in Table 4.

Constraints and opportunities Gender and other crosscutting issues

It was found out that both men and women are involved in day to day dairy activities. However, it was clearly evident that activities that require more man-power such as building cow sheds, herding cows, watering of cows and milking of cows rest with the men while women spends much time cleaning cows shed and feeding of young calves, assist in milking of cows. Children also assist before going to school.

Farmers' aspirations for dairy farming and marketing

After considering major constraints and opportunities, the following aspirations and opportunities related to dairy farming and marketing were proposed by farmers.

- Introduction of suitable livestock breeds for different farmer categories.
- Introduction of improved livestock feeds suitable for intensive and semi-intensive management systems in the area
- Training in appropriate feed conservation methods to address shortage of feeds
- Enhancing skills in appropriate husbandry practices.
- Assess occurrence of livestock diseases and institute appropriate preventive measures
- Construction of dams to improve access to water
- Easy access to affordable bank loans
- Existing cooperative in addition to sell of drugs, to start selling animal feeds.

Table 5: Mbare: Major constraints and opportunities in dairy development

Problem/ Constraint	Causes/effects		Coping strategies	Opportunities/ suggested solutions
	Causes	Effects		
Insufficient Water	Climate type (semi arid) long dry season Lack of knowledge in water conservation techniques.	Death of cattle Failure to keep improved cattle breeds Increased poverty Failure to educate children shortage of food and animal feeds	Construction of cattle water points (valley dams or water pans) Fetching water for animals	Trainings on water harvesting techniques. (requires outside assistance) Availability of forage seeds (requires outside assistance) Environmental protection (planting of more trees; can be implemented locally)
Land scarcity	high population density	Low milk production Poverty	cultivation of forages replacement of Ankole cattle by improved cattle zero grazing system	Trainings on forages conservation techniques Availability of forage seeds (requires outside assistance)
Prolonged	Semi arid climate type	Death of cattle	fetching and buying	There is a need for quality

Dry season		Low milk production poverty	water for animals conservation of animal feeds mainly Napier grass	forages seeds Training on forages conservation is needed (Both outside and local assistance)
Animal diseases	Drought Unrestricted movement of animals. Delay of animal vaccination exercise	Death of cattle Quarantine of livestock and livestock products Poverty	Individual vaccination of animals Avoiding of unnecessary movement of cattle Treatment of sick animals' by farmers themselves.	Vaccination of cattle on time Having an access to veterinary services (Both outside and local assistance)
Inadequate market for Milk	Lack of materials used in milk handling High production of milk and less demand especially in wet season. Poor quality of milk as result of poor handling facilities.	low income from milk poverty	Improvement of the quality of milk Joining farmers cooperatives Getting right materials used in testing and transporting milk	Trainings of farmers on improvement of milk quality Construction of milk collection centres (requires both local and outside assistance)

Mbare: Findings on innovation actor analysis

Table 6: *Mbare: Status of Innovations and Actor analysis*

Conventional activities	*Innovations*	*Innovating farmers*
Prevailing conventional inputs stated were: Animal health/disease control and animal health service delivery Watering, feeding and feed supplementation Farm implements used e.g hoes, pangas, axes and spades Animal housing premise e.g calf pens	Animal treatment by vet. Technicians, especially those keeping improved cattle Construction of valley dams and water pans on farms Zero grazing and supplementation with rice bran and watering of cows at home Forage cultivation especially Napier grass.	Mbare village 1. Kagabo Andrew 2. Shomeri Gato Wilson 3. Gatete Theo 4. Rubumya Sam 5.Kayonga Sam 6. Mpambara Godfrey Kajumo Village 1. Mutsinzi Jerver 2. Kalisa Eugene

		3. Butera Augustin 4. Butera Vianey 5. Nkubito 6. Sayinzoga Charles 7. Ruhima Steven
Practices in dairy: 1. Natural breeding using local bulls. 2. Selling of milk to individual traders	Artificial insemination and use of improved bulls. Sell milk at milk collection centre.	Nearly all farmers are encouraged to use A.I with help of Rwanda Animal Resource Development Authority.
Products being implemented: Meat, milk, butter, yoghurt, hides		
Breed: Majority of farmers keep local cows.	Crosses of: Ankole X Friesian, Ankole X Sahiwal, Ankole X Jersey.	

KEY INNOVATIONS AND ACTORS INVOLVED

Generally majority of farmers keep local cows, and few keep crosses of Ankole with Friesian, Sahiwal, or Jersey. No pure exotic breeds were reported in the area. Farmers who keep improved animals keep them under a semi-intensive system and are relatively better educated. A.I technicians are the main actors involved but because of their low numbers, their services are not effective, and many farmers have resorted to use of bulls.

Farmers in this site are organized in a cooperative known as Duterimbere Cooperative, which was responsible for the construction of milk collection centre with help of PADEBL.

3. New animals (crosses) are acquired by cross breeding. Some farmers also sell their local animals and buy crosses from Uganda, assisted by Rwanda Animal Resource Development Authority. Others buy them through bank loans acquired from Rwanda Development Bank. However, these animals are few and limited to farmers who are relatively better educated.

The only commonly available forage species is Napier grass. Farmers acquired Napier grass with the help of ISAR and Umutara Community Resource and Infrastructure Development Project (UCRIDP). Few farmers are aware of other quality forage species but they do not know whether they could acquire the seeds. Farmers also lack knowledge about forage conservation.

The reason put forward by farmers for the low number of innovators in the area was: poverty and lack of awareness.

6. Conversion of milk to butter and yoghurt is not a new practice.

The actors, their activities, achievements and challenges

There are several actors involved in activities geared towards development of Nyagatare District (see Table 1.7). Although these were identified and their relationships determined, there seems to be little interaction between the different actors.

Table 7: Mbare: Innovations and Actor Analysis Matrix

Key actors	Activities and services	Achievements	Challenges	Status 0= Not active in the village 1= present in the village but less active 2= Present in the village and fully active	Satisfaction 1=good, 2=satisfactory 3= poor
PADEBL, a Government project under MINAGRI working to develop the dairy sector	Construction of milk collection centre Construction of cattle market Construction of valley dams	The increase of milk price The increase of cattle price Availability of electricity power and water	The water points are not enough Installed weighing scales are not functioning properly	Present in the village but less active, because the project activities will end this year (2008)	Satisfactory because farmers have to sell milk at collection centres unlike in the past where a trader could determine market milk prices
Cooperative (Duterimbere)	Marketing farmers' milk, Sale of Veterinary drugs, Salt for cattle, Training of farmers in animal husbandry practices. Improved cattle acquisition (by buying or A.I)	- Farmers have been employed by the project. - Poverty reduction (farmers been able to save some little money) - Obtaining bank services (farmers are paid through the bank) - Loans from cooperatives - Vet. Pharmacy at milk collection centre.	The price of milk is still low -Membership fee is high i.e. not affordable for the new farmers to join. Unavailability of animal feeds (concentrates) at the milk collection centre. Takes Long time to obtain a credit from the bank.	Present in the village but less active, its still building its capacity.	Satisfactory, the concern of farmer with this cooperative is its high membership fee that is not affordable to all farmers.

Umutara community Resource and Infrastructure development Project.	Availability of water Environment protection. Construction of bridge Improved cattle – Through training of A.I technicians and Animal health worker. -Provision of animal feeds.	- Water available from construction of communal valley dams Trees have been planted Relatively production of milk has increased. Employment of local people. Training has been done but the trainees not empowered. Only Napier grass has been provided.	Water is not enough Roads are not constructed The price of milk is still low	Present in the village but not active as it used to be.	Satisfactory, the project is less active because its period is phasing out.
Traders			Trading system is not good, many farmers deliver to collection centres themselves.	Not active in the village	Poor, not active especially after farmers started taking milk directly to milk collection centres.
Veterinary and AI technicians	Artificial insemination Vaccination Treating animals	- Vaccination of cattle	A.I technician were said to be few that can't be relied on by farmers. Poor vet. Services that majority of farmers treat animals by themselves.	Present in the village but less active	Poor, because they can't be at the time their technical assistance is required.
Community members	Construction of water points Treatment of cattle them selves	Availability of water Cultivation of Napier grass	Improvement in dairy farming still low Failure to join farmers cooperative	Present in the village but less active	Poor because farmers have no means as far as capital is concerned.
Bank Populaire	- Saving money	- Security of money	- Getting credit from bank is not easy	Not active in the village	Poor, This could be because it's the only bank present in the area

Actors and linkages considered important but are weak in the dairy sector

Farmers have a very weak link with veterinarian and livestock officers, who are considered by farmers as non-functional. Majority of participants noted that veterinary technicians are not accessible because they are few in number compared to the number of cattle. Although they are few those who are available are not active. They suggest that at least each sector to have a veterinarian.

Government projects and other NGOs are considered to be important actors but have weak linkages with the community. This is attributed to the fact that the NGOs initiate activities without putting in place, the necessary sustainability measures. The government also brings activities without consulting farmers.The link between farmers and traders is very weak because they buy cattle from farmers at very low prices. Farmers are discouraged by this link, and at times farmers prefer selling their cows to individual farmers. The farmers suggest that the government should put in place appropriate prices that encourage farmers to balance input and output.

It was said that farmers have been encouraged to save their money in banks. However, acquiring bank loans has been difficult. There is only one bank, and it takes a long time to get response from the bank on the applications. When the response comes, it is usually too late for the loan to be useful. This makes the link weak.

Actors and linkages considered important but missing in the dairy sector

Artificial Inseminations technicians: Generally, A.I services in this sector are poor. Farmers complain that A.I technicians are few and are unable to respond on time when their services are required. There is no A.I technician available locally hence farmers have to rely on one from Nyagatare, several miles away. The success rate of the AI services offered is very low, consequently, farmers resort to using bull service from bulls whose pedigree is usually not known.

Feed suppliers: Considered to be important but missing. Farmers suggested that their cooperative should also sell animal feeds in addition to the current veterinary drugs shop. They also suggest that membership fee be reduced to allow more farmers to join the cooperative.

Farmer innovators, special activities, linkages, challenges and limitations

Innovations by innovators were not considered to be useful to participants. The innovators were perceived to have the benefit of accessing money, which is possible because they have security to offer for bank loans. They are relatively well educated and considered smart enough to link with developmental projects and extension services.

Institutional and Policy changes observed by farmers

Construction of cattle markets: where weighing balances are installed and price per kilogram is fixed.

Construction of the milk collection centres: this helped farmers avoid exploitation by individual traders especially in pricing.

Tagging of animal before they are taken to market: this helps farmers in getting equal access to the market.

Formation of farmers' cooperative (Duterimbere): farmers can communicate their problems through this cooperative.

Transportation of milk: farmers discouraged from transporting milk in jerry cans.

Differences in linkage between different actors

According to farmers, the two actors, Umutara Community Resources and Infrastructure Project (UCRIDP) and Projet d'Appui au Development du Bovin Laitier (PADEBL) are relatively appreciated by farmers. However, these projects are currently not active because their operational duration is nearly over. They have, nonetheless, left a remarkable impact in the community.

Summary

- Identified innovations were:
- presence of water on farmers' farms
- animals treated by vet technicians
- feed supplementation
- use of A.I or improved bulls
- innovating farmers falls in rich and moderately wealth category.
- Key actors included PADBEL, Rwanda Animal Resource Development Authority (RARDA), Umutara Community Resource and Infrastructure development Project (UCRIDP), and community members. A.I technicians and Veterinarians in this area were considered non-functionalDifficulty in accessing bank loans

Mbare: Findings on livestock breeding and feeds

Breeding preferences and strategies

The important traits known to farmers and the breeds that posses them are summarised in Table 8. The ranking was done by 'bean-piling', where the breed that possessed the desired traits was allocated more beans.

Most farmers preferred crossbreds because of increased milk production and the higher prices the cows fetch when sold. For instance, it was indicated that a crossed heifer costs around over 300,000 Frw while the Ankole can hardly fetch more than 150,000Frw. However, poor farmers preferred Ankole cows because they are unable to meet the expensive management requirements of improved breeds. One farmer said "we treat sick Ankole cattle by ourselves but for improved cows we have to call vets, which is expensive for some farmers".

Common breed kept across the group

Ankole breed is the most common breed kept, the reasons being historical. However farmers said extension officers advise them to reduce the number of local cows and keep the exotic ones (mainly Jersey) because of diminishing land sizes as result population increase.

Modes of acquiring animals

Animals are acquired in three ways:

- Through inheritance

- Through purchasing from Nyagatare District, others from Uganda.
- Through "One Cow One Family" (Gahunda ya girinka): a government initiative for every household to own a cow by 2015.

Basis of the decision on which animal to buy

It was said that the decision is based on phenotypic traits. Rwanda Animal Resource Development Authority helps farmers to buy animals that are free from Brucellosis. Farmers were aware of the importance of parentage in deciding which animal to buy however, farmers seemed not to rely on it because one could hardly find farmers who keep reliable records.

Methods of breeding available in the community and reasons for their preference

Majority of farmers said they practice natural mating. Other farmers use both AI and natural mating, and fewer farmers use Artificial Insemination. This is indicative of the poor performance of the AI Programme. Farmers reported efficiency of A.I to be quite low. Some farmers observed that they serve up to four inseminations before conception, which is expensive because the farmer pays for each service. When there is no conception, a farmer decides to use bulls. Farmers also complained that is difficult to get A.I technician in good time. The reason stated was that these technicians are few and have to travel long distances to reach the farmers.

Table 8: Mbare: Ranking of dairy breeds by preference

Desired Traits	Breed type		
	Ankole cattle	Sahiwal crosses	Friesian crosses with Ankole
Milk production	●●	●●●●	●●●●●●
Income\Cash	●	●●●●	●●●●●●●
Taste (milk)	●●●●●●	●●●	●
Butter	●●●●●●	●●●	●●●
Manure	●●●●●●	●●●●●●	●●●●●●
Growth	●●	●●●●	●●●
Meat (taste)	●●●●	●●●●	●●●
Disease resistance	●●●●●●●	●●●●	●●●
Drought tolerant	●●●●●●●	●●●	●

Factors and challenges considered in choosing a breeding service

It appears the technology of A.I is well known to the farmers and preferred. However, its poor efficiency leave farmers with no option other than using bull service. Use of bulls presents the risk of brucellosis, which is considered serious among other sexual transmitted diseases. Thus efficiency of A.I needs to be enhanced if farmers are to optimize production from the dairy industry.

Existing feeds in the community and their source.

The type of animal feeds used in the area include: natural grazing, Napier grass and Tripscum. Other feeds available include crop residuals (maize stovers, potato vines, and banana leaves and stems) in various combinations, depending on the season and their source.

Forages preferred and Reasons

Napier grass is the preferred feed and the reasons given in order of their importance to farmers were as follows: palatability, availability, easy to cut, ability to sprout, stomach fill (biomass) and drought resistance.

Locally available livestock feeds

Basically, farmers rely on natural grazing and some practice dry season feeding using Napier grass (in cut and carry system). Others provide crop residues where available. Table 10 presents the forage production constraints and availability.

Feed/ forage calendar and estimation of feed sufficiency

In Mbare village, common forage used is Natural pastures and Napier grass and crop residues used especially in dry season. Even though tripscum was mentioned to be present in the area, farmers reported that its availability is negligible that even it's not known to most of farmers.

Table 9: Mbare: Annual Animal feed Availability

Season	Months	Forages			Feed sufficiency
		Grazing pastures	Napier grass	Crop residues	
Dry	January	10	-	-	+ +
Dry	February	8	1	1	+ +
Wet	March	9	1	-	+ + +
Wet	April	10	-	-	+ + +
Wet	May	9	1	-	+ + +
Dry	June	8	1	1	+ +
Dry	July	5	2	3	+
Dry	August	5	3	2	-
Wet	September	8	2	-	+
wet	October	10	-	-	+ +
Wet	November	10	-	-	+ + +
Wet	December	8	2	-	+ + +

Legend: - Not available; + Available in low quantities; + + Available in moderate amounts; + + + Available in sufficient quantities

Forage production constraints

Table 10: Mbare: Forage production constraints and ranking

Constraints	Rank	Affecting	
		Numbers (production)	Productivity
Prolonged dry periods.	2	Number decrease by 5-10 %	Reduced by 50%
Land scarcity	3	Reduction in numbers depend on number of cattle and size of land	Affected by 20%
Lack of knowledge in forage conservation techniques.	4	Numbers reduced by 5%	Affected by 15%
Absence of quality forage seeds.	1	Numbers un affected	Decreased by 30%

Coping strategies at times of forage scarcity

- Napier grass is kept for tough periods when Natural pasture is scarce.
- Hiring of other farmers' plots (farmers without cattle)
- Use of crop residues.
- Those with high numbers as compared to land size cope by reducing cattle numbers.

Feed supplements used

- Mineral salt
- Rice bran

Summary

- Most considered trait was milk production and crosses of Ankole and Friesians were preferred.
- Local breed (Ankole) was the predominant breed kept.
- Main modes of breed acquisition was through inheritance and purchase.
- Natural grazing was most common source of animal feed.
- Napier grass was the most common forage in the village.
- Forage production constraints in order of importance: Absence of quality forage seeds, prolonged dry periods, land scarcity and lack of knowledge in forage conservation techniques.

Mbare: Summary and Conclusions

Farmers in Mbare hub, like in other Eastern parts of the country, mainly keep local Ankole cattle and a few exotic cattle. Exotic breeds are generally expensive to purchase and require more inputs. Despite the sensitization of farmers by extension agents to up-grade the local cows using A.I, farmers still use crossed bulls, some of unknown pedigree leading to downgrading the few dairy animals that are present. Failure to adopt this technology is partly attributed to availability of

the AI technicians. One method of improving the efficiency of AI is by utilizing early non-pregnancy diagnosis to reduce the postpartum period. It appears the technology of AI is well known to the farmers; however, its efficiency needs to be enhanced if farmers are to optimize production from the dairy industry.

Absence of inseminators and veterinary assistance in this hub affects production because farmers have to make long distances to access technical assistance and drugs. It was revealed that most innovating farmers were literate, and probably other farmers lagged because of illiteracy. This has serious bearings on production methods and management ability of the farmers. High illiteracy rate hinders adoption of suitable technology and makes it difficult to communicate to the producers any knowledge of technological significance. There is a high possibility of lack of balance between appropriate technology required for intensive dairy production systems and the skills of existing farmers. This will be one of the major weaknesses in the drive towards intensification and modernization of dairy production activities as enshrined in the country's vision 2020.

It was observed that most farmers practice natural grazing. This is attributed to the high illiteracy and poor knowledge of other feeding regimes. This leads to a higher inclination towards traditional animal husbandry practices. These practices cannot survive the on-going reduction of farm sizes as a result of high population density leading to increased pressure on the land. They are not inline with government's initiative to intensify and modernize production systems, which maximizes production per unit.

In conclusion, majority of farmers in Mbare hub depend on agriculture with livestock farming ranking first as source of livelihood and income. However, from the results it is apparent that livestock farming is hampered by a number of constraints particularly lack of technical know-how to modernize and intensify production. Chief among problems identified was poor performance of A.I and inadequate animal feeds, combined with poor animal health delivery services. The number of dairy animals in the area is limited by diminishing land sizes and scarcity of pastures and fodder crops. Consequently, future development in dairy will depend on intensification, introduction of genetically superior breeds, availability of dairy support services, increased use of dairy inputs, and training on intensive dairy husbandry.

PRA REPORT FOR KABARORE, GATSIBO DISTRICT, RWANDA

Introduction

Kabarore hub is located in Gatsibo District, Kabarore sector. The two PRA sites that were selected in this site are: Kabarore Village which forms part of Kabarore trading center, and Bihinga Village. The hub is located in the lowland agricultural zone in Eastern part of Rwanda, along the Kayonza–Kagitumba highway, about 60km to the Rwanda–Uganda boarder. It is the main trading centre for Gatsibo District. The local communities in Bihinga village practice both livestock and crop farming. For Kabarore Village, business is also among the main sources of income. The rainfall received is bimodal, with short rains (season A) falling between September and December and long rains (season B) extending from March through May. The dry season extends between June and August.

The PRA for Kabarore was conducted on 17th and 19th September in the two selected villages of the Kabarore hub. As part of the EADD Project, its aim is to help move smallholder farmers out of poverty by improving production and access to markets for dairy products. Farmers who participated were mainly local residents, some of whom were local leaders.

The initial contacts in these potential sites were made through the sector and District administrator in Gatsibo, who arranged a meeting with the cell leader. In the course of this meeting, the objectives of the study and expected outputs were clearly defined. The criterion for selection of the PRA representatives was agreed on. The sites were selected on the basis of their accessibility and infrastructure.

The PRA representatives were selected on the basis of gender (both men and women represented) and age (participants had to be between 18 – 65 years of age). They had to be residents of the village, knowledgeable and with interest in dairy cattle keeping. Participants' turn-up was impressive, as the number of women nearly balanced with men. Participating farmers consisted of livestock keepers, although others also practiced crop farming and business in addition to cattle keeping. Some of the participants were local leaders.

Six PRA tools (resource map, wealth ranking, livelihood analysis, constraints and opportunities in dairying, innovation actor analysis and livestock breeding and feeding analysis) were applied. The tools were effective in getting farmers into open discussion, exchanging information freely. The objectives of this qualitative baseline survey were achieved, inter alia, assessment of the current status of farmers and main actors involved, constraints faced in the dairy development, and identification of possible potential intervention strategies that would improve dairy production.

Communication between the participants and PRA team was very good. This was demonstrated by the openness with which farmers, both women and men expressed their views. This reveals a strong interest in dairy farming at this site.

In general, the farmers' strong interest in dairying could be addressed through
Assisting farmers to genetically improve local breeds either by A.I or use of exotic bulls.
Improving access to markets for milk, or its transformation into other dairy products to avoid spoilage. 3. Addressing issues of animal diseases 4. Appropriate feeding procedures.

Table 11: Kabarore: PRA village workshop profile information

Country: Rwanda			
District	Gatsibo		
Other administrative unit	Kabarore		
Name of Village	Kabarore village, Bihinga village		
Date of village workshop	17 and 19/09/08	Duration of workshop	one day by village
Venue for the workshop	Sector office and, Church. And primary	Language of workshop	Kinyarwanda.

	school.		
Number of participants (Kabarore village)	female:10 Male:13	Number of participants (Bihinga village)	Female: 12 Male: 13
Names of facilitators	Mr. Aman Placid, Mr. Jean Paul Munyaneza, Dr. Manzi Maximillian (Coordinator)		
Names of note takers	Mr. Rukundo Emannuel, Mr. Gafishi Martin, Mr. Mupenzi Mutimura		
Names of observers	Miss. Kanzaire Claire, Mr. Kalisa Prosper		
Special conditions (weather, local activities, etc)			

Kabarore: Community Resource Mapping

After initial guidance from the PRA team, the farmers from Kabarore village and Bihinga village drew the resource maps of their areas. The key features identified were roads, churches, trading centre, Schools, electricity, cattle market and settlements.

Table 12: Kabarore: community resource profile

MAPPING ISSUES	DETAILED INFORMATION
Natural Resources	
Water	Tap water is available in Kabarore village but absent in Bihinga village. People fetch water from dams and the water is available in both seasons (dry and wet seasons)
Crop fields	Crop fields were present. They grow mainly bananas, maize and beans.
Rangelands	Farmers have privately owned rangelands.
Gardens	-
Irrigation schemes	-
Mines	-
Forests	-
Infrastructure	
Roads	There was a good network of roads (murram) in Kabarore Village, in addition to the main tarmac road to Kigali. However, Bihinga Village lacks the network of murram roads that is found in Kabarore village.
Settlements	People live in grouped settlements, locally known as “Umudugudu”. Other farmers, especially cattle keepers, live on their farms, which is particularly the case for Bihinga village.
Commodity markets	Available in Kabarore Village but absent in Bihinga Village. Conversely, there is a cattle market in Bihinga village but absent in Kabarore village
Milk sale point (informal or cooperative/ self-	There is no milk collection centre in the area. The milk collection centre is approximately 12km from Kabarore in a place known as Rwimbogo. Farmers sell milk at the Kabarore trading centre, or to buyers who in turn take it to

help group)	Kigali.
Milk cooler/ processor	There is no milk cooler in the hub. Milk is transported in metallic cans or plastic jerry cans.
Dip tank/cattle crush	-
Vet Clinic	There is no veterinary clinic. Farmers call veterinarians by telephone and buy them the drugs from Nyagatare District veterinary clinics.
Stock feed sources	-
Cattle market	-
Electricity	Available in Kabarore village but absent in Bihinga village
Social services	
Health	No Health centre in either villages. The nearest health centre was reported to be about 8km from the village
Schools	Government primary schools and secondary school (Bihinga SSS) are present
Church	Churches are available (both Anglican and Pentecostal Church)
Local administration	Presence of cell office and sector office
Traditional Authorities	None
Extension offices	Located at the sector
NGO and Government project offices	Head offices are located in Nyagatare town, which is approximately 30km.
Land use system	
Croplands and use of crop residues	Land is mainly used for crop and livestock farming. Crops mainly grown include bananas, Maize, Cassava and Beans. Cattle are kept in individual grazing farms. The crop residues were reported to be used as livestock feed, while others used them for mulching banana plantation.
Communal rangelands	None
Grazing reserves	None
Seasonal herd movements	No reports of seasonal herd movement as it has been discouraged by the Government
Farms	Majority of farmers own small farms. Generally, there is a balance between livestock and crop farming.

Most important economic activities

Mixed farming is the main activity, but livestock farming ranks first and farmers from Kabarore village, especially women were reported to be engaged in off-farm activity.

Relationship between the resource items, challenges and opportunities

From the resource items reported by farmers, it was clear that:
- In Bihinga Village, there is no commodity market. Farmers at the extreme end of village have to travel for more than 1 km to purchase common goods from Kabarore. In Kabarore village, there is no cattle market and people from Kabarore also sell their cows at the Bihinga cattle market.

- There are no coolers in this area and this presents the problem of heavy losses through spoilage, especially during the wet season.

- Long distances are travelled to watering points. Animals have to cross the main road to Kigali. This makes them prone to being hit by motorists

- There is a cattle market where farmers can sell their animals.

- Government is active in sensitizing the farmers on the benefits of land consolidation.

- Electricity is accessible as the site is located on the main road to Kigali.

Gender

In this village, it was observed that gender parity exists in all activities (art, business, agriculture and farming). The farmers reckoned that there is "no activity for men and no activity for women", and resources were equally shared. Children (male and female) help parents only in the morning and evening or during the holidays, otherwise they are encouraged to go to school.

Kabarore: Wealth Ranking

Wealth Categories

Five wealth categories were identified in the community. These are: Rich, moderately rich, poor, moderately poor and very poor. The wealth assessment of the different categories is summarised in Table 12.

Table 13: Kabarore: criteria/assets for different wealth categories

INDICATORS/ CRITERIA	WEALTH CATEGORY				
	RICH (only applicable in Kabarore)	MODERATE RICH	POOR	MODERATE POOR	VERY POOR
Number of Cattle	Owns Over 15 cross of exotic and local cattle.	-Owns 3improved cattle + 25 local cattle or owning 50 local cattle	Owns from 1-10 Ankole cattle+ 4 goats	Owns from 1-3goats+5 chicken	0
Land Size	Owns about	Owns about	Owns about	Owns about	0

	25ha	18ha	2ha	1ha	
Off-farm income activities - Bihanga (Salary/month)	Not applicable in Bihanga	100.000 Frw	50 000 Frw	2000 Frw	500 Frw Survives as causal labourer
Off- farm income activities - Kabarore (Mainly Trade) (amount of money is able to save)	Wholesaler shop in Kabarore town (4.500.000 Frw)	Crop and cows trader, small shops and kiosks (2.500.000 Frw)	Selling of sorghum beer, retailer, (200,000Frw)	Subsistence farmer (40,000Frw)	1000 Frw
Housing Standard	Constructed using bricks, thatched with iron sheets, cement and wall painted with toilet and bath inside. (modern house)	Constructed using Mud blocks , cement, Iron sheets, metallic doors	Mud house, wooden doors and windows , thatched with Iron sheets	Grass thatched hut.	Plastic Sheeting
Crop Production	1.5 tone of beans, 2 tones of sorghum, 1.5 tones of maize	1 tone of beans, 1,5tone of sorghum, 1 tone of maize	200kgs of beans, 200kgs of sorghum, 200kgs of maize grain	100kgs of beans, 100kgs of sorghum, 100kgs of maize grain	0
Education for Children	Educated up to university lever	University level	Secondary	Primary	Primary (affords because free universal primary education
Difference in Wealth (%)	15%	25%	55%	15%	5%
Difference in Gender/Age % women in each categories	10%	12%	30%	9%	3%
Difference in Marketing (liters of milk sold daily)	40L/day	15L	5L	0	0

Criteria for wealth according to the order of importance

As summarized in Table 12, the criteria for assigning wealth status in Kabarore (in order of importance) were: number and breed of cattle, land ownership (size in ha), off-farm activities (mainly trade and employment), housing standard, crop production, education of children. In Bihinga village, no person was identified as rich. This category was identified only in Kabarore, where the rich person is also engaged in business and they also have wholesale shops, public transport business, and rental houses. The moderately rich people have restaurants and small shops. The poor person engage in very small business that assist them to survive such as selling tomatoes, peppers, onions, and fruits. The very poor person survives as casual laborers.

The importance of livestock in relation to other wealth criteria

The community regarded livestock as very important to them. It was through sales of livestock and livestock products that farmers were able to build a house. This is not possible for salaried workers who earn 200,000 Frw per month. Apart from that, milk is useful for the growth of children, and for the health of old people. A farmer can sell milk and pay school fees for his children. In this community, having a large number of cattle is prestigious and earns one, respect in the community. Thus, farmers regard cattle keeping as essential because cattle keeping boost the growth of their business. In addition, those who practice crop farming get manure to fertilize their crop fields. All these factors make livestock ownership in this area to be regarded as a first indicator of wealth status

Farmers' interest in dairying across the wealth categories

The rich and moderately rich people in the community are the ones who show stronger interest in dairy as compared to other wealth categories because many of them have adopted use improved bulls while others use A.I to upgrade their local cows. As a result, the rich farmers produce more milk compared to other categories, and hence generate more income. Poor farmers also have interest but due to the lack of adequate A.I services, and the high cost of improved bulls, they use local bulls. They still manage cattle in traditional ways, and their production is therefore still limited.

Gender and other crosscutting issues

According to the community members in Kabarore, 7% out of the 10% of rich people are women, and also, 15% out of the 20% of moderately rich people are women. Although the women are seen as rich and moderately richer than men in these two categories, they account for 40% out of the 60% in the poor category. This in turn makes them the majority of the poor category. On the other hand in Bihanga, men and women are almost equally distributed across the wealth categories, where 12% out of 25% of moderately rich are women, 30% out of the 55% of poor people were women, 9% out of the 15% of moderately poor people are women, and also 3% out of 5% of very poor. All children go to school, assisting their parents during holidays

Kabarore: Analysis of Community Livelihoods

Source of livelihoods, their contribution to cash income and trends

- Livestock keeping was reported to be becoming more important. This is due to the fact that farmers are aware of the benefits of keeping improved breeds, and reducing the numbers of less productive local cows. Trends are that farmers are gradually changing from traditional animal husbandry practices towards modern farming.

- Crop production is increasingly becoming important because soils are still fertile. Production is still good with little inputs. Farmers are being discouraged by extension agents from growing many different crops mixed on a small plot of land. Instead, they are encouraged to grow one type of crop that is suitable in that area.

- Business, motorcycle taxi transport, house construction, carpentry are all increasingly becoming important especially in Kabarore village, which is rapidly becoming an important trading center for Gatsibo District.

The identified sources of livelihoods were ranked using pair wise matrix method as shown in the Table 14. The first five sources were selected in the following order of importance: Livestock rearing, Crop farming, Business, motorcycle taxi transport and house construction.

Table 14: Kabarore: Sources of livelihoods and cash income

Current sources of livelihoods	Contribution to livelihoods (Rank in order of importance)	Contribution to cash income (1=very important, 2=somehow important, 3=not important)	Trends (1=becoming more important 2=less important, 3=new activity)	Differences in terms of gender and age
1. Livestock	1	1	1	Both men and women rear livestock
2. crop production	2	1	1	Cropping is done by women and men
3. Business	3	1	1	Both men and women.
4. Artisan	9	3	2	Women do the knit (kuboha uduseke)
4. Taxi motor	4	1	1	Youth
5. House construction	5	1	1	Both men and women
6. Tailing	6	2	2	Both men and women
7. Carpentry	7	2	2	Men
8. Mechanics	8	2	2	Men

Main source of cash income

The sources of income for members of this community are mainly from three sources:
Sales of livestock and livestock product, mainly milk and butter. Goats or chicken were viewed belonging to women and/ or children. The income generated from these small stock is spent on purchase of food/ kitchen budget and other household requirements
Sales from crop produce significantly contributed to cash income in this site especially in Bihinga village, as it was noticed that the size of land left for crop and livestock farming is nearly the same.
Business benefited especially farmers from Kabarore because many stay in the trading center and thus have got many off-farm activities.

The relationship between income source and listed livelihoods was that the order of importance in which farmers ranked sources of livelihood was the same order they were ranked as sources of cash income.

Role of Dairying in livelihoods and cash income

Even though farmers in this area mentioned crop production and business to be important sources of income and livelihood, they ranked livestock first in terms of livelihood and cash income. This is clear indication of the role of livestock in this community. Farmer in this area are disadvantaged by absence of a cooling facility, thus income generated from milk sales is restricted to sales at the trading center, restaurants, milk bars or to individual milk business traders who transports to Kigali. In addition to income generated from milk sales farmers also get income from sale of bulls, butter and hides, crop farming. Farmers also are able to get manure.
The income generated from sales of livestock and milk is chiefly spent on school fees for children, restocking, construction of houses, payment of hired labor, and purchase of assets such as bicycles, motorcycles and land.

Trends observed in the relative importance of livelihoods and cash income
The changes reported by farmer are that cattle have been very important to them and are increasingly becoming more important. In the past, these farmers used to keep large numbers of cattle (in hundreds) just for prestige. Production has significantly improved following sensitization of farmers by extension agents, discouraging communal grazing and encouraging them to reduce number of producing animals and remain with few improved numbers that the capacity of their individual farms can accommodate. Farmers are being encouraged to transform their indigenous cattle through crossbreeding with exotic breed and with adoption of these improved breed, farmers are optimistic that this increasing trend of livestock especially cattle being source of income is going to remain.

No significant trends were reported in relative importance of crop production as a source of livelihood and cash income because few farmers practice the modern crop farming despite the encouragement from extension agents. The relative importance of business is also recognized. Others sources do not have recognizable wide impact on the community.

Gender and other crosscutting issues

Generally, in all sources of livelihoods and cash income, with the exception of motorcycle taxi and carpentry where youth and men are involved respectively, men and women implement activities together. However, men are more involved in activities that require more energy.

Kabarore: Constraints and Opportunities for dairy farming

The main problems/constraints identified in dairy farming in Kabarore hub include inadequate water, land shortage, lack of veterinary drugs, lack of knowledge in dairy farming, few A.I technicians, low number of improved bulls, inadequate animal feeds, milk spoilage due to lack of cooling facilities, animal diseases, low number of veterinary doctors, and prolonged dry seasons. The causes/effects, suggested coping strategies to solve the main constraints, and opportunities/suggested solutions are illustrated in Table 15.

Farmers' future aspirations related to dairy farming and marketing
After considering the major constraints, the following future aspirations related to dairy farming and marketing were proposed by farmers.

- Construction of milk collection centre with milk cooling facilities to avoid milk spoilage and low prices accepted in fear of milk getting spoiled
- Formation of dairy cooperative which is absent in this area
- Training in forage conservation techniques and their adoption
- Adoption of intensive production system
- Having a veterinary pharmacy in the area
- Construction of dams to improve access to water
- Increased number of A.I technicians
- Adoption of simple rain water harvesting techniques.

Table 15: Kabarore: Major constraints to dairy development, causes, copping strategies and opportunities

Problem/Constraint	Causes/ effects		Coping strategies	Opportunities/ suggested solution
	Causes	Effects		
Inadequate Water	-Lack of water sources -No valley dams or boreholes -Long dry seasons	-Death of cattle -low milk production -Increase of cattle disease frequency -Wandering of cattle in search of water	-farmers dig their own bore holes. -Own valley dams Buying water (50frw per 20liters) - Watering cows at long distance.	-Valley dams construction -Boreholes. -Sensitization of farmers on rain water harvesting
Land shortage	-High population compared to the total land size -Lack of knowledge on land use efficiency	-Grass (pasture) shortage -Low milk production	-Forage cultivation (Napier grass) -Farm paddocking -Decrease of cattle numbers	-Forage production -Training on forage conservation techniques.

Lack of Vet drugs	-No veterinary pharmacy in the area	-Death of cattle -Low milk of production	-Purchase of veterinary drugs far from farms -Use of traditional medicine e.g. Umubirizi	-Competent veterinary officers are needed. -Veterinary pharmacies are required
Lack of knowledge in dairy farming	-Lack of training to farmers -Ignorance: Less information about disease transmission	-Use of traditional farming practices -Poverty: Death of cattle, low milk and meat production	-Exchange of information among farmers -listening to the radio	-Need of training in dairying -Study tours
Few AI technicians or improved bulls	-Lack of improved bulls and few AI technicians in the area. -Poorly equipped A.I technicians. -Lack of financial capacity to purchase improved bulls	-Keep local cattle with low milk production -Small number of improved cattle among farmers -poverty	-Use of local bulls AI services are obtained far from farm.	-Need of improved bulls -Need of AI technicians near the community.
Inadequate animal feeds.	- Lack of forage seeds -Limited knowledge on animal feeding - There are no animal stock feeds. - Low financial capacity	-feed shortage -Death of cattle -Low milk production	-Napier grass production -Feed on crop residues.	-Need for different quality forage seeds. -Need of knowledge on land use efficiency -Knowledge regarding feed conservation. - Animal feed shop in the area
Milk spoilage due to lack of cooling facility.	-No milk collection centre.	-Lack of milk market -Milk is sold at low prices -Poverty	- Accept to sell milk at low prices - Farmers consume the milk. -Selling milk through informal market. -Consuming milk themselves	-Construction of milk collection centre -Availability of milk cooler
Animal diseases and few Veterinary	- Cattle wandering -Lack of veterinary services	-Death of cattle -Epidemic diseases	-Farmers treat animals by themselves.	-Competent veterinary officers are needed

Doctors	-Wild animal borne diseases - Low number of veterinary officers.	-Low milk of production	-Farmers look for veterinary services far away from their farm	-prohibition of cattle wandering -Veterinary pharmacies are required -Need of a veterinary pharmacy. -Farmers need training so as to treat their cattle when need arises.
Drought	- Dry season	- Death of cattle -Low milk and meat production	- Reducing number of cattle kept to remain with manageable number.	- Forage conservation. - Buying animal feeds

Gender and other crosscutting issues

In this area, both men and women were reported to be involved in livestock keeping, and the role of women was satisfactory. Both men and women were interested in dairy farming more than other activities. Apart from livestock activities, community members are involved in different income generating activities such as trading, where women are considerably involved, and motorcycle taxi business which is exclusively for male youth.

This exercise was among the most interesting exercises to farmers. Both men and women equally participated in the discussion.

Kaborore: Findings on innovation actor analysis

Table 16: Status of Innovations analysis chart

Conventional activities	Innovations	Innovating farmers

Prevailing conventional inputs stated were: Animal health/disease control and animal health service delivery Watering, feeding and feed supplementation Farm implements used e.g hoes, pangas, axes and spades Animal housing premise e.g calf pens	Animal treatment by vet. Technicians for especially those keeping improved cattle. Construction of valley dams and water pans in farmers farms. Zero grazing and supplementation with rice bran and watering of cows at home. 4. Forage cultivation especially Napier grass.	Kabarore village 1. Nyirigira Eugene 2. Gatete J. Bosco 3. Nkunda Steven 4. Utamuriza betty 5. Kagarama 6. Mbabazi Bihinga Village 1. Mujinya Charles 2.Mutagonya James 3. Samson 4. Karemera. 5. Mutabazi
Practices in the dairy: 1. Natural breeding using local bulls. 2. Selling of milk to individual milk traders	1. Artificial insemination and use of improved bulls.	Nearly all farmers are encouraged to use A.I with help of Rwanda animal resource development Authority.
Products being implemented: Meat, milk, butter, yoghurt, hides and skins.		
Breeds: Majority of farmers keep local cows.	Crosses of: Ankole x Friesian, Ankole x Sahiwal, Ankole x Jersey.	

Key innovation and involved actors

The key innovations identified are: keeping of pure exotic cows or upgraded crosses, zero grazing, use of concentrates for feeding cattle, forage cultivation, use of A.I. Generally, majority of other farmers keep local cows and few keep crosses. One of them named Nyirigira Eugène has been rewarded by H.E The President of the republic of Rwanda because he was exemplary in dairy farming compared to the other farmers. Lack of awareness was reported to be the most important cause of the current cattle keeping system.

The actors, their activities, achievements and challenges

The farmers clearly gave the key actors that intervene in different community activities welfare in dairy farming with aim of improving people's welfare in Gatsibo District.

Table 17. Kaborore: Innovation actor matrix analysis

Key actors	Activities and services	Achievements	Challenges	Status 0= Not active in the village 1= present but less active 2= Present and fully active	Satisfaction 1=good, 2=satisfactory 3= poor
District authorities	-Construction of schools, health centre, roads, water and electricity -Land distribution -Linking farmers to NGOs	Construction of schools, health centre, housing to vulnerable, market, roads, water and electricity done but not fully. Land distribution and Linkage of farmers to NGOs done	-Water and electricity still not enough. -Decentralization of AI technicians.	Present in the village active	satisfactory
UCRIDP	-Valley dam construction -Tree planting - Boreholes construction -Trainings of farmers	-Trees planted -Valley dams constructed - Some Boreholes constructed - Few farmers trained - Trees planted	- Water not enough - Farmers training.	Present in the village but less active	poor
PADEBL	-Construction of cattle market. - Training A.I technicians Construction of milk collection centre.	- Cattle market Constructed -Cattle distribution to farmers -A. I technician trained -Construction of milk collection centers	-Construction of milk collection centre not achieved in this village.	present in the village but currently less active	good
RSSP	- Giving loans to farmers	- Loans given	RSSP has not paid 40% of the credit given to farmers	Not active in the village	poor

			as promised		
World Vision	- Distribution of goats	- Distributed goats	-	Present in the village and fully active	good

Ubudehe	Cow distribution to poor.	Local cattle distributed		Present in the village and fully active	good
Veterinary officers	AI services Vaccination	Animals Vaccinated	- Weak AI services -Treatment	present in the village but less active	satisfactory
Traders	-Buy cows	-Buy cows	No challenge	Present in the village and fully active	satisfactory
Banque populaire	- Provide loans to farmers - Security of farmers' money	- Provided loans to farmers - Security of farmers' money	No challenge	Present in the village and fully active	satisfactory

NOTE

The farmers appreciated the role of the government because of its contribution in the development of infrastructure development, including roads, schools, health centers, and shelter. They said that the government reaches the population through the district and it's the best outcome of the decentralization policy of the government; but they said that electricity and water are still obstacles to rural community development.

The Umutara Community Resources and Infrastructure Development Project (UCRIPP), has contributed in the construction of valley dams and tree planting in the area. However, according to the community, these rural infrastructures do not have a positive impact because some valley dams were destroyed and have not been rehabilitated. That is why during the assessment of the impact; the farmers said the project implementation has failed in the village.

The scenario is different with the Rural Sector Support Project (RSSP), which assists farmers who have income generating projects to get loans by paying for them 40% of the loan. This project was reported to have failed to pay for all the accepted projects, and was considered as weak and not visible at farmers' level. Farmers need projects that can assist them to make profit from their livestock keeping.

"Projet d'Appui au Developpement de l'Elevage du Bovin Laitier" (PADEBL):: This government project is working under the ministry of agriculture and animal resources and is actively involved in

dairy cattle development in the country. During the PRA discussions, farmers in Bihinga Village showed their satisfaction with the project. The most important activity by the project is the construction of milk collection centers and cow distribution, but farmers in Bihinga lacked milk collection centers.

World Vision was much appreciated by farmers because this project specialized in the distribution of small stock like goats, which reaches more poor people. This helps them get manure for their fields and a little money to fulfil other basic needs.

Ubudehe: is a government programme under the Interior Ministry working with farmers at a local level towards the implementation of development projects. For this particular area, Ubudehe distributes cows to farmers who are able to grow forage and those who are able to construct cow sheds.

Veterinary service: is an important key actor that should be closer to farmers. Unfortunately it is not properly working and is considered as offering the worst quality of service to farmers. According to the farmers, AI technicians are not helping the farmers because they are few in number and seem to have little experience. Farmers are keen to get assistance in order to improve their cattle, regardless of the source of the breed improvement service.

Traders: There is a strong link between the traders and the farmers because traders always buy livestock and livestock products from farmers. This is considered by farmers as strong partnership because sale of livestock and livestock products is their main source of income. Whenever the farmers are in need of money, they easily get it from traders. Traders reach farmers through their cooperative.

The bank: The bank which is closet to the farmers is the “Banque Populaire de Kabarore”. This is a very important institution that provides credits to farmers in order to implement their micro-projects, and maintain the security of their money. Farmers are happy with its services. However it should be noted that some farmers are still unaware of bank services.

Linkages between farmers and different actors

The following results were obtained from the analysis of various linkages between farmers and other actors, and among the actors: The actors that have strong linkages with the farmers are PADEBL, World Vision, the government, traders, and Banque Populaire, and Ubudehe. Other actors such as UCRIDP, Veterinary officers and AI technicians are important but have a weak linkage with the farmers. The weakness of UCRIDP link with farmers is because the valley dam constructed by that project dried out and the farmers do not know how it will be rehabilitated. The weak linkage between farmers and veterinary officers and AI technicians is that they are seldom seen in the area and consequently do not offer the expected services to them. They said that when AI technicians are needed, they often come when it is late for the cow to be inseminated (out of heat).

Missing actors

- Veterinary Drug suppliers
- Feed suppliers

- Dairy cooperative.
- Micro credit providers

Institutional and policy changes observed by farmers
- Sensitization of farmers to replace or improve indigenous cattle through buying or crossbreeding.
- Redistribution of land where by no household is allowed to get more than 25 ha from the government.
- One cow one family policy
- Adoption of semi intensive and intensive production systems.

Kaborore: Findings on livestock breeding and feeds

Breeding preferences and strategies

The important traits known to farmers and the breeds that posses them are summarised in Table 18 below. Bean piling was used to conduct the ranking where the breed type that possessed more of a particular desired trait than others, received more number of beans.

Table 18: Kaborore: Summary of farmer preference for breeds and their traits

Breed type	Milk production	Income\Cash	Disease resistance	Drought tolerant	Butter	Manure	Body weight
Cross Friesian	●●●●●●●●●●●●	●●●●●●●●●●●●	●●●	●●●	●●●	●●	●●●●●●●●●●●●●●●●●●●●●●●●
Cross Sahiwal	●●●●●●●	●●●●●●●●●●	●●●●●●●●●●●●●	●●●●●●●●●●●●	●●●●●●●●	●●●●●●	●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●
Cross Jersey	●●●●●●●●●●●●●●	●●●●●●●●●●●●●	●●●●	●●●●	●●●●●●●●●●●●	●●●●●●●●●●●●	●●●●●●●●●●
Brown Swiss	●●●●●●●	●●●●●●●●●●●●●	●●●●●●●●●●	●●●●●●	●●●	●●●●●●●●●●●	●●●●●●●●●●●●●●●●●●●●●●●●
Ankole cattle	●●●●	●●●●●●●●●	●●●●●●●●●●●●●●●●●●●●●●●●	●●●●●●●●●●●●●●●●●●●●●●●●	●●●●●●●●●●●●●●●●●●●●●●●●	●●●●●●●●●●●●	●●●●●●●●●●●●●

Farmers' deductions

Local cattle are better than crosses in terms of milk butter fat, taste, and disease and drought resistant but crosses are better than local cattle in milk production and income per head.

- Jersey- Ankole crosses and Friesian - Ankole crosses have high milk production compared to others.

Cross Friesian, Cross Sahiwal provides more manure than the rest because they eat more quantities of feed.

Crosses of Sahiwal are drought tolerant

Ankole is the overall preferred breed

Common breed kept across the groups

Ankole breed is the most common breed kept, the reasons being historical. However farmers said extension agents advise them to reduce the number of local cow and keep the exotic ones (mainly Jersey) because of diminishing land as result population increase.

Modes of acquiring animals

They were acquired in three ways:

- Acquired from inheritance
- Purchasing from within especially in the Eastern province, and from Uganda.
- "One cow one family"-, a government initiative for every household to own a cow by 2015
- Gift from friendship (e.g. some who got them from H.E The President of Republic of Kenya)

Basis of the decision on which animal to buy

The decision was said to be based on phenotypic appearance

Methods of breeding available in the community and reasons for their preference

Majority of farmers said they practice natural mating; they use crosses of Ankole X jersey, Ankole X Friesian and Ankole X Sahiwal bulls. Farmers use these crossed bulls not because they preferred but because they do not have another option. A.I technicians are considered as non existent in the community because they are few and work with a large number of farmers. Furthermore, some of them work with other institutions and the community work is not a priority. This is the reason why community members prefer bulls as a substitute to AI because they are keen to improve their production.

Factors considered when choosing a breeding service and challenges faced in preferred breeding service

Efficiency, affordability and disease are factors that are considered by farmers in the selection of selection of breeding services. For instance, farmers pay 1500 frw per service for AI but because of many repeats end up paying 3000- 4500Frw.This is in addition to transport and communication costs. This is quite high for many farmers, who choose to use local bulls. Unfortunately, this exposes the animals to diseases such as brucellosis.

Findings on feeds and feed services

Existing feeds and their sources

The type of animal feeds used in the area include: Natural grazing, Napier grass, and rice bran. Other feeds available include crop residuals (maize stovers, potato vines, banana leaves and banana stems) in various combinations, depending on the season and their availability in the village.

Supplementation

Farmers (few) supplement with rice bran and Sorghum porridge.

Forages preferred and reasons for preference

Napier grass is the preferred feed and the reasons given in order of their importance to farmers were as follows: palatability, availability, and drought resistance. Other reason farmers gave was that they prefer Napier because they have no idea about other forages species to compare it with.

Ranking of the different locally available livestock feeds

Basically farmers rely on Natural grazing and some practice dry season feeding using Napier in cut and carry system. Others provide crop residues when available. Natural grazing as source of animal feed rank first. It should be noted that most of farmers who supplement their animals with Napier grass are those who mainly practice intensive management.

Feed/forage calendar and estimation of feed sufficiency

Table 19: Animal feed Availability and their estimation within a calendar year

Season	Months	Forages			Feed sufficiency
		Grazing pastures	Napier grass	Crop residues	
Dry	January	10	-	-	+ +
Dry	February	8	1	1	+ +
Wet	March	9	1	-	+ + +
Wet	April	10	-	-	+ + +
Wet	May	9	1	-	+ + +
Dry	June	8	1	1	+ +
Dry	July	5	2	3	+
Dry	August	5	3	2	-
Wet	September	8	2	-	+
wet	October	10	-	-	+ +
Wet	November	10	-	-	+ + +
Wet	December	8	2	-	+ + +

Legend: - Not available + Available in low quantities + + Available in moderate amounts + + + Available in sufficient quantities

Forage production constraints

Challenges and constraints that farmers face in accessing and producing sufficient forage are summarised in Table 20.

Table 20: Kabarore: Forage production constraints and their rank

Constraints	Rank	Affecting	
		Numbers(production)	Forage Productivity

Prolonged dry periods.	2	Number decrease by 5-10 %	Reduced by 1/2
Land scarcity	3	Reduction in numbers depend on number of cattle and size of land	Affected by 20%
Lack of knowledge in forage conservation techniques.	4	Numbers reduced by 5%	Affected by 15%
Absence of quality forage seeds.	1	Numbers un affected	Decreased by 30%

Coping strategies at times of forage scarcity

- Napier grass is kept for drought periods when Natural pasture is scarce.
- Hiring of other farmers plots (for those farmers with out cattle)
- Use of crop residues.
- Those with high numbers as compared to land size cope by reducing cattle numbers.

Kaborore: Conclusions and Recommendations

Conclusions

Cattle are the major source of livestock products, and dairying remains the most important source of livelihood and income.
Majority of farmers keep indigenous cattle.
Farmers cover long distances in search of technical assistance from livestock experts and to get access to drugs.
Water shortage remains a problem in the region. The major source of water for the dairy cows was identified as the dam and swamps, which exposes the animals to diseases
Farmers are less informed about the importance of supplementation. Maximum production of a cow can only be supported with supplementation
Major constraints include inefficient A.I services, poor delivery of veterinary services, and inadequate animal feeds.
Milk is mainly sold locally. Spoilage due to this unreliable market is common.
Natural grazing is the main source of feed for cattle.
Some farmers practice mixed grazing which involved grazing augmented with stall feeding of elephant grass. This system does not guarantee enough feed for the cattle kept leading to poor nutrition.

Recommendations

- Farmers should be encouraged to form a dairy cooperative.
- Training of farmers on feeds and feeding programmes
- Capacity building of farmers in product marketing
- Organization of farmers around milk commodity.
- Need for having a milk cooling facility.
- Training of farmers in forage conservation techniques.
- Training and empowering A.I technicians or provision exotic bulls.

- Training of farmers in simple rain water harvesting techniques
- General herd health programmes such as tick borne diseases, and internal worms

PRA REPORT FOR BWISANGA, RWAMAGANA DISTRICT, RWANDA

Introduction

A PRA for Bwisanga hub was conducted on 21st and 23rd September 2008. This is part of the qualitative baseline survey by the East African Dairy Development Project in three East African countries that aims at helping smallholder farmers' move out of poverty by improving milk production and market-access systems.

Bwisanga site is located in Rwamagana District, Bwisanga sector. It is located in the lowland agricultural zone in eastern part of Rwanda along Kigali–Kayonza highway, about 45km from Kigali city. The local communities in this area practice both livestock keeping and crop farming. The sector receives bimodal rainfall, with short rains (season A) falling between September and December and long rains (season B) extending from March through May. The dry season extends between June and August.

The initial contacts in the potential sites were made through the sector administrator in Bwisanga who arranged a meeting to meet cell leader (see Table 3.1 for details on the workshop). In the course of this meeting the objectives of the research study and expected outputs were clearly defined. The criteria for selection of the PRA representatives was agreed on. These sites were selected on the basis of their accessibility and infrastructure. The two PRA sites that were selected in this site are Mugusha and Akanogo villages.

The PRA representatives were selected on the basis of gender (both men and women represented), age (participants had to be in at least 18 years and below 65 years. They had to be residents of the villages, knowledgeable and interested in dairy cattle keeping. Participants turn up was impressive, with women's attendance fairly equal to that of men. Participating farmers consisted of livestock keepers, with others practiced crop farming in addition to livestock keeping. Local leaders were also represented.

Six PRA tools proposed in the checklist were applied. Farmers engaged in open discussion and freely exchanged information. The objectives of this qualitative baseline survey were achieved, which included an assessment of the current status of farmers and main actors involved, constraints faced in the dairy development and identification of possible potential interventions.

Communication between the participants and PRA team was very good. This was demonstrated by the eagerness with which the farmers discussed issues.

Generally there were no special challenges that affected our outcomes.

Table 21: PRA village workshop profile information

Country: Rwanda

District	Rwamagana		
Other administrative unit	Bwisanga		
Name of Village	Mugusha village, Akanogo village		
Date of village workshop	21 and 23/09/08	Duration of workshop	one day by village
Venue for the workshop	Church and primary school	Language of workshop	Kinyarwanda.
Number of participants (Mugusha village)	female:14 Male:10	Number of participants (Akonogo village)	Female: 12 Male: 13
Names of facilitators	Mr. Rukundo Emannuel, Mr. Mupenzi Mutimura, Dr. Manzi Maximillian (Coordinator)		
Names of note takers	Aman placid, Gafishi Martin, Jean Paul Munyaneza		
Names of observers	Kanzaire Claire, Kalisa Prosper		
Special conditions (weather, local activities, etc)			

Bwisanga: Community Resource Mapping

After initial guidance from the PRA team, the farmers drew the resource maps of their villages. The key features identified include roads, settlements, church, crop fields, and tree plantation. The details are given below.

Table 22: Bwisaga: community resource profile

MAPPING ISSUES	DETAILED INFORMATION
Natural Resources	
Water	There are two public water taps in the village and about 10% of the population have water taps in their homes.
Crop fields	Cropping is the second main activity in the village. The main crops grown are bananas, maize, beans, sweet potatoes and groundnuts.
Rangelands	None
Gardens	Each family has a small garden of vegetables and bananas around the house.
Irrigation schemes	None
Mines	No mines in the village
Forests	Scattered forests, one for the government and others for individual farmers. Swamp is under District management
Infrastructure	
Roads	There are three local roads that cross the village which were reported to be in bad condition.
Settlements	In this village houses are constructed a long side the roads.
Commodity markets	No commodity markets in the village, the unique existing market for the

	community is 4 km from the site.
Milk sale point (informal or cooperative/ self-help group)	The lack of a milk sale point is the most serious problem in the area. Farmers sell their milk in an informal market at Rwamagana, 4 km away. This market is not sufficient. At times, the milk is brought back especially during the rainy seasons when milk is in excess.
Milk cooler/ processor	None
Dip tank/cattle crush	No dipping tank or cattle crush in the village. Animals are tied and sprayed, or a crush is used.
Vet Clinic	None. Majority of farmers buy drugs and treat animals by themselves
Stock feed sources	None in the village. Farmers get rice bran at rice processing factory, 2 km away. Other concentrates like molasses is bought from Kabuye Sugar Factory in Kigali, 40 km away.
Cattle market	-
Electricity	.-
Social services	
Health	No health centre in the village, the nearest health centre is 1.5km (at Gishari Police Training School).
Schools	There is no school in the village; children go to the neighbouring village.
Church	Three churches are present in the village; Catholic, Pentecostal and Anglican.
Local administration	Only one for Bwisanga Cell
Traditional Authorities	No one in the village.
Extension offices	Not found in village found at sector level.
NGO offices	Located in Rwamagana town, 4km from the village
Government projects	-
Land use system	
Croplands and use of crop residues	Cropland is separated by network of roads passing between them. Crop residues, mainly maize stover are used as cattle feed; groundnut residues are also used but are scarce. Farmers use bananas stems but only used when there is no any other source of feed.
Communal rangelands	Not available in the community.
Grazing reserves	None Grazing confined to individual's farms
Seasonal herd movements	No cattle movements, farmers use zero grazing and feed their cattle in cow sheds.
Farms	-

Most important economic activities

Livestock farming is the most important activity followed by crop farming. The two are thought to have equal economic importance in the village. Other economic activities practiced include artisanship, small business and employment. These are, however, considered to have little impact on livelihoods.

Majority of the farmers use zero grazing. A big part of land is used for crop farming. Each household has its own vegetable garden and bananas around the house.

Challenges and opportunities

- Lack of a milk cooling facility
- Lack of a commodity market and cattle market
- No feed stockist and veterinary drug store.
- Lack of extension agents' office in the village
- Farmers are familiar with zero grazing.
- Good network of roads

Bwisanga: Wealth Ranking

Wealth criteria in order of their importance

Farmers from Bwisanga identified the major wealth indicators as: Number of cattle land/ownership, number of hired labour, type of housing, food sufficiency (number of meals), ability to participate in trades/off-farm income generating activities, and ability to meet other needs, for example, school fees.

Wealth Categories

On the basis of the above indicators four wealth categories were identified in the community. These are: Very rich (Umukire), Rich (Umukungu), Poor (Umukene) and Very poor (Umutindi). The wealth assessment of the different categories is summarised in Table 3.2.

Criteria for wealth according to the order of importance

Livestock ownership: A farmer who owns 15 exotic cattle and above is considered as rich person in the community. While one with 6 cattle including some crosses, is considered to be moderately rich. The poor own about 1 local cattle (Ankole) and then moderately poor and very poor have nothing.

Land ownership: In the case of land size, the rich own more than 10 hactares. The moderately rich own 5hactares, while the poor own 1hactare. According to the community members, the very poor person owns no land.

House type: Those categorized as rich build houses using bricks, cement, and coloured iron sheets for roofing. The moderately rich build houses using mud blocks, cement, and ordinary iron sheets but their houses are small compared to those of rich people. The poor person builds houses using wood, ordinary iron sheets and sand. The very poor build houses using wood, with thatched roofing.

Trades/ off-farm activities: A rich person is also engaged in business, and they have wholesale shops, public transport businesses, breweries depots, forests and rental houses. This person is estimated to have fifteen million (15 million) of Rwandan francs as cash according to community members. The moderately rich people have wealth of 1 million Rwandan francs and small shops. The very poor person engages in casual labour so as to survive and get food for the day.

Ability to meet school fee needs: The children for rich people acquire education up to university level and they can afford private schools. The moderately rich people educate their children up to

secondary level, mostly in government schools. Children of poor people acquire education up to secondary level but most of them end their studies in primary school. In the case of very poor people, their children acquire only primary education because the government does not charge fees.

Meals affordability: Meals also are another factor that distinguishes people in this community. According to the community members, the rich person eats four (4) times a day. That is breakfast, lunch, snacks, and dinner. The moderately rich and poor people eat two times a day, which is lunch and dinner. The very poor person eats only one (1) meal a day after performing casual labour.

Table 23: *Bwisanga: Major criteria/ assets for different wealth categories*

Criteria	WEALTH CATEGORIES			
	RICH	MODERATE RICH	POOR	VERY POOR
Number of cattle	Owns 15 exotic cattle and3 Ankole	Owns 6 crosses	Owns 1 Ankole	0
Land size	Owns about 10 Ha	Owns about 5 Ha	Owns about 1 Ha	-
Hired labor	10 labourers/day	5 labourers/day	1 person	0
Housing standard	Constructed using Bricks, cement, iron sheets, painted, electricity,	Made of Mud blocks, iron sheets, cement	Mud, iron sheets, sand	Trees and thatched grasses
Meals	Affords 4 meals a day	2 times a day	2 times a day	1 time a day
Trading	15 millions	1 million	250 000	0
Education for children	University level Government or private	Secondary level Government	Primary and secondary	Primary
Difference by - gender - and age	 15% 40-60	 50% 45-70	 70% 30-70	 80% 50-90

The importance of livestock in relation to other wealth criteria

Comments from the community were that a cattle owner is able to build a house and a wholesale shop. The poor and very poor people cannot afford this. Besides, milk is useful for the growth of children and supports better health for old people. A farmer can sell milk and pay school fees for his children. In this community, most of the rich people have a large number of exotic breeds compared to the local Ankole breed. So, this helps them to engage in other activities like business.

Farmers' interest for dairying across the wealth categories

According to the explanation given by farmers, most of them have cross breeds which were acquired from the Government and NGOs, e.g., Heifer International and Send A Cow. Other farmers purchase the animals. Most of the farmers (poor to moderately rich) said that they want to engage in modern livestock farming but due to financial problems and few AI services they have not been able to improve their local breeds. In this case, cattle farmers prefer to use bulls which are also not easy to get. As a result, not many farmers are enjoying the benefits of dairying. The poor are mainly interested in owning a cow as a source of manure for crop farming.

Gender and other crosscutting issues

According to the community, women contribute to cattle keeping by cutting grass for the animals, giving water and cleaning their sheds. Because of the needs of zero grazing it was noted that woman's role in dairy farming is more important than that of men. Except for the holidays, children go to school but when available, they assist their parents in different activities, for example, fetching water, looking after cattle and assisting in business activities.

Comments

During the discussions, farmers said that AI technicians and veterinarians are not performing their duties accordingly. The veterinarians live far away from the farmers, which makes their services inefficient.

Bwisanga: Community Livelihoods

Table 24: Bwisanga: Major sources of livelihoods and their contribution to livelihood and cash income.

Current sources of livelihoods	Contribution to livelihoods (Rank in order of importance)	Contribution to cash income (1=very important, 2=somehow important, 3=not important)	Trends (1=becoming more important 2=less important, 3=new activity)	Differences in terms of gender and age
1. Cropping	2	1	1	Men, women and orphans that head household
2. Livestock	1	1	1	Livestock is done by women, men and orphans
3. Artisan	4	2	1	Business is

				done by men, women and orphans.
4. Small business	3	3	1	Men, women and orphans that head household.
5. Government employment	5	3	1	Only men and women.

Main source of livelihoods in the village

The main sources of livelihoods in order of importance were: livestock keeping, crop farming, business, artisanship and government employment. Livestock keeping was said to be the main economic activity, however, as it was clearly stated by farmers its recently that livestock has taken over crop production as main source of livelihood to the extent a good number still believed crop production was main source of livelihood but through voting livestock become first by one vote difference.

Main source of cash income

The main sources of income for members of this community are from sales of livestock and livestock product and equally important crop production especially bananas are important source of income. Others are business, artisan and salary for government employees; however, these benefit only a few individuals in the village.

Role of Dairying in terms of livelihoods and cash income

Dairy farming in Bwisanga plays a significant role with regard to livelihood and cash income. This role has been especially appreciated after the farmers' adoption of zero grazing system. It has led to increased milk production. In addition, as cows are fed under the shed farmers are able to collect manure for their fields resulting in increased crop production. Further, savings increased because of reduced labour and animal diseases.

Trends observed in the relative importance of livelihoods and cash income

Livestock keeping in this region is increasingly becoming an important source of livelihood and cash income. Farmers expect remarkable cattle improvement, because they are aware of the importance of improved breeds in terms of milk production compared to local ones.

There has been no significant change in crop production for the past 10 years. This is because of poor farming techniques. However, with the current government policy regarding agricultural (improved seeds, fertilization, and land use consolidation); changes in crop production are expected to increase significantly in the near future

Gender

In general, it was observed there is gender parity in this community. The difference was observed in business types where more women do small business than men and are increasingly becoming involved in activities that used to be considered as men's activities (e.g., masonry)

Constraints and Opportunities in Dairy Farming

In order of importance, the main problems/constraints mentioned in Dairy farming in Bwisanga hub are:

1. Small number of AI technicians
2. Lack of milk market
3. Lack of Animal feeds
4. Low producing breeds
5. Inadequate water.

The causes/effects, Suggested coping strategies to solve the main constraints and opportunities /suggested solutions are summarised in Table 3.4.

Table 25: Bwisanga: Major constraints, causes, copping strategies and opportunities in Dairy Development

Problem/ Constraint	Causes/effects		Coping strategies	Opportunities
	Causes	Effects		
Lack of market for milk	- Absence of milk collection centre. - Absence of Dairy cooperative.	- Low income leading Poverty: - No money to pay for labour and other inputs.	- Transform milk to butter. - Drinking it among ourselves. - Exchange it for other food staffs	- Availability of milk collection centre. - Having a constant market for our milk (local assistance)
Absence of vets in the village.	- Livestock are given less value. - Fewer in number	- Death of Cattle - Move long distance to get vets and its expensive	Treat animal by ourselves.	- Training of community animal health worker - Availability of vet equipments. (local assistance)
Expensive Veterinary Drugs.	-No veterinary pharmacy in the area	-Death of cattle -Low milk production -Poverty – Decrease of exotic cows	-Buy drugs through informal way and some especially with local cows use traditional herbs.	-Availability of veterinary pharmacy in the village -Availability of Qualified veterinaries in the village. (both local and external assistance)

Poor AI services	-Few number of A.I technicians. -Incompetence to some A.I technicians - A.I technicians not empowered.	- Down grading few exotic cows that we have leading to decreased milk production -Poverty	-using local bulls	Availability of A1 Services and technicians in the village. (both local and external assistance)
Water insufficiency	-Dry seasons -Rain water not captured	- Death of cattle - Loss of money - Low milk - Poverty.	- Buying water (40frw per 20liters) - Watering cows at long distance - Construction of water tanks	- Construction of valley dams - Sensitizing farmers on water tanks construction - Trainings on water harvesting techniques especially during the dry seasons. (both external and local assistance)
Lack of Animal feeds	- Lack of forage seeds - Lack of knowledge on animal feeding and conservation techniques - Absence of stock feed shops - Low financial capacity	- Low milk production - Poverty	- Feeding on natural pasture - Feeding with banana peels - Feeding with maize Stover and other nature pastures	-Availability of Animal feeds shop in the village. - Need of forage seed - Trainings on animal feeding and conservation. (both external and local assistance)
Lower number of improved breed in the village.	-low financial capacity	- lower milk production.	- use of improved bulls.	- better A1 Services - Availability of Exotic breeds Avail Exotic bulls (require both local and external assistance)

Gender and Other Crosscutting Issues

In this village, women are more involved in livestock keeping. This is because there are many more women than men as a consequence of the 1994 genocide, which affected more men than women. Some women are even genocide survivors. Apart from livestock activities, community members are involved in different income generating activities, such as trading where men are more actively involved.

Farmers' future aspirations related to dairy farming and marketing

After considering the major constraints, the following future aspirations related to dairy farming and marketing were proposed by farmers:

- Introduction of suitable livestock breeds for different farmer categories.
- Introduction of improved livestock feeds suitable for intensive management systems in the area
- Training in appropriate feed conservation methods to address shortage of feeds
- Enhancing skills in appropriate husbandry practices.
- Assess occurrence of livestock diseases and institute appropriate preventive measures
- Training in rain water harvesting techniques.
- Easy access to affordable loans
- Formation of local dairy cooperatives.

Bwisanga: Findings on innovation actor analysis

Table 26: *Bwisanga: Status of Innovations analysis chart*

Conventional activities	Innovations	Innovating farmers
Prevailing conventional inputs stated were: Animal health/disease control and animal health service delivery Watering, feeding and feed supplementation Farm implements used e.g hoes, pangas, axes and spades Animal housing premise e.g calf pens	1. Feeding animals with rice straw and molasses. 2. Zero grazing and supplementation with rice bran and watering of cows at home. 3. Forage cultivation especially Napier grass.	Bwisanga hub 1. Sagahutu J.D 2. Ruzindana Bernard 3. Mukamwezi Judith 4. Mukabaranga Beatice 5.Mukabarang, Venancia 6. Mukanzigiiye Godeberthe 7.Kampire Belancile 8. Kabalisa Cecile 9. Kanyumba Alphansine 10. Mukamugasa Marie
Practices in the dairy: 1. Natural breeding using local bulls. 2. Selling of milk to individual milk traders	1. Artificial insemination and use of improved bulls.	Nearly all farmers are encouraged to use A.I with help of Rwanda animal resource development Authority.
Products being implemented: Meat, milk, butter, yoghurt, hides and skins.		
Breed: Majority of farmers keep local cows.	Crosses of: Ankole X Friesian, Ankole X Sahiwal, and Ankole X Jersey.	

Key innovation and involved actors

The key innovations identified are: Keeping exotic cows, zero grazing, use of concentrates and rice straw for feeding cattle, and forage cultivation. The actors involved in these innovations: The district agronomist as a representative of the Central Government is the main actor involved in the community, which farmers compare to a parent. The key actors involved are Heifer international and Send Cow Rwanda. However, the farmers stressed that the District has failed to address the issue of access to Veterinary personnel and A.I technicians

Actors and linkages considered important but are weak in the dairy sector

Veterinarian and livestock extension workers including A.I technicians are highly needed by farmers but have a very weak link and according to farmers they are considered non-functional. But those provided by Heifer and Send a cow appear to be having a relatively strong link with the farmer

Acquiring bank loans has been difficult especially getting collateral for a loan. Agricultural projects banks are normally reluctant to finance farmers. This also makes the link with farmers weak even though the actor is important.

Actors and linkages considered important but missing in the dairy sector

1. Dairy Cooperative: Absence cooperative in the village makes the farmers work in a disorderly manner as they don't have one voice.
2. Feed suppliers: Are also important but missing actors in the area.
3. Drug Suppliers: Important but missing

Institutional and Policy changes observed by farmers

One family one cow programme
Keeping improved breeds
Intensive production system adoption.
Transportation of milk in metallic/ aluminium cans, farmers discouraged to transport milk in jerry cans.

Differences in linkage between different actors

Weak linkages with actors such as ubudehe was because the programme required the farmer to demonstrate capability to provide animal feed and housing, which poor farmers could not afford, to qualify for a cow donation. As for A.I and veterinary technicians, farmers wished to have them in their villages otherwise farmers have stronger link with especially Heifer and Send cow.The actors, their activities, achievements and challenges
Several actors were identified and the details are provided in Table 27.

Table 27: *Bwisanga: Innovation Actor Analysis*

Key Actors	Activities and services	Achievements	Challenges	Status 0= Not	Linkages 0=not	Satisfaction 1=good,

				active in the village 1= present but less active 2= Present and fully active	functioning 1=weak 2=needs strengthening 3=strong	2=satisfactory 3= poor
Ministry of Agriculture and Animal Resources	-Bringing of AI semen -Bringing donors to farmers -Follow up of cows given to farmers by different projects.	Bringing AI semen - done -Bringing donors to farmers - done -Follow up of cows given to farmers by different projects.- done	No challenges	Present in the village and fully active	strong	Good
Heifer International	- Trainings - learning from other farmers trained - Giving improved cows to farmers -provide veterinarians to farmers to follow donated cows only.	- Trainings -learning from other farmers trained- done -Giving improved cows to farmers - done -provide veterinary officers to farmers - done	The number of veterinarian still low	Present in the village and fully active	strong	Good
SEND A COW	-Trainings - Construction of modern cow shade	-Trainings - Done -Construction of improved cow shade -	No challenges	Present in the village and fully	strong	Good

	-Giving cows to farmers -Provide veterinarian to farmers only following cows donated by the same NGO	Done -Giving cows to farmers-done -Provide veterinarians to farmers-done		active		
UBUDEHE Project	Giving cows to farmers	Giving cows to farmers - Done	No challenges	Present in the village and fully active	needs strengthening	satisfactory
Veterinary officers			There is no permanent vet. In the village	Not active in the village	not functioning	poor
Bank populaire	- Provide loans to farmers - Security of farmers' money - Provide interest	- Provided loans to farmers - Security of farmers' money - Provide interest	No challenges	Present in the village and fully active	needs strengthening	satisfactory

Bwisanga: Findings on livestock breeding and feeds

Breeding preferences and strategies

The important traits known to farmers and the breed that posses them are summarised in Table 28 below.

- Local cattle are better than cross breeds in terms of disease resistance, butter quality but they produce low milk and manure because they are less consumers.
- Friesian cross was reported to be very good cross. It ranks second after Jersey in terms of milk production, first in terms of manure production. Farmers also noted that the Friesians have faster rate, and are the most expensive cross breed on the market because it is vigorous and has high milk production, although they are less resistant to resistant to diseases.

- Friesian x Sahiwal is also a good cross because they have good resistance to diseases, and have high meat production. In general Friesian crosses were reported to be better than other cross breeds.

Table 28: Bwisanga: Farmer breed preferences and traits

Breed type	Milk production	Income\ Cash	Butter	Manure	Growth	Meat/taste	Disease resistance
Local cattle	●●●●	●●●	●●●● ●●●● ●	●●●	●●●●● ●	●●●●●●● ●●	●●●●●●● ●●●
Frisian cross	●●●●●●● ●●●	●●●●● ●●●●●	●●●● ●●	●●●●● ●●●●●	●●●●● ●●●●	●●●●●●● ●	●●●●●
Jersey	●●●●●●● ●●●	●●●●● ●●●●	●●●● ●●●	●●●●● ●●●●	●●●●● ●	●●●●●	●●●●●●● ●
Jersey cross	●●●●●●● ●	●●●●●	●●●● ●●●●	●●●●● ●●	●●●●● ●●●	●●●●●●●	●●●●●●● ●●
Frisian x Sahiwal	●●●●●●● ●●	●●●●● ●	●●●● ●	●●●●● ●●●	●●●●● ●●●●	●●●●●●●	●●●●●●●

Common breed kept across the group

Ankole breed is the most common breed kept, the reasons being historical. However farmers said extension agents advise them to reduce the number of local cow and keep the exotic ones (mainly Jersey) because of diminishing land as result population increase.

Modes of acquiring animals

They were acquired in three ways:

- Acquired from Heifer and Send cow projects
- From purchasing
- From gift (government policy, one cow one family Programme)

Basis of the decision on which animal to buy:

It was indicatedsaid that the decision is based on phenotypic appearance.

Methods of breeding available in the community and reasons for their preference

Majority of farmers said they use natural mating followed by using both AI and natural mating. and lastly artificial insemination (A.I). At times, farmers have no option because of inefficient A.I Programme due to lack of enough A.I. technicians. This forces some farmers to choose natural mating when actually it is not their preferred mode of breeding. For instance, farmers indicated that they have one technician serving four (4) sectors. As a result he only ends up offering A.I. services to his friends.

Factors considered when choosing a breeding service and challenges faced in preferred breeding service

Efficiency, affordability and disease are factors that farmers consider when selecting a breeding service. Natural mating is mostly used by farmers and the challenge they are facing is that the bulls' pedigree is usually not known. They end up down grading the few exotic cows they have. This gets worse for farmers who have no access to crossed bulls because they end up using local bulls.

Feeds and Feed Sources

Existing feeds in the community and their source.
The type of animal feeds used in the area include: Natural grazing, Napier grass, rice bran, banana peels, banana stems and maize stovers. Other feeds available include crop residuals (potato vines, rice straw) in various combinations depending on the season. Apart from molasses which is bought from Kigali, other feed sources are from within the community.

Forages preferred and Reasons

Napier grass is the preferred feed because it is palatable and available to farmers in both dry and wet season. However, it is the only one that farmers have been exposed to and encouraged to plant by extension agents.

Ranking of the different locally available livestock feeds

Napier grass (cut and carry feeding system) ranks first among the locally available livestock feed. Natural grazing comes second because the area is known for practicing zero grazing.

Feed or forage calendar and estimation of feed sufficient

Table 29. Bwisanga: Seasonal/Annual Animal feed Availability

Season	Months	Forages					Feed sufficiency
		Napier grass	Grazing pastures	Banana stem	Rice straw	Crop residues	
Dry	January	4	2	1	1	2	+ +
Dry	February	3	2	1	-	4	+ +
Wet	March	3	4	-	-	3	+ + +
Wet	April	3	5	-	-	2	+ + +
Wet	May	3	4	1	1	1	+ + +
Dry	June	4	3	1	1	1	+ +
Dry	July	4	1	2	1	2	++
Dry	August	5	1	2	-	2	+
Wet	September	4	2	1	1	2	+
wet	October	3	5	-	-	2	+ +
Wet	November	2	4	1	2	1	+ + +
Wet	December	3	4	1	-	2	+ + +

Legend: - Not available + Available in low quantities + + Available in moderate amounts + + + Available in sufficient quantities

Napier grass is the widely used forage through out the year in the area and normally fed together with rice bran. Rice bran is costly and not easily found from the rice processing factory (1kg=30Frw). Farmers use banana stems but indicate that they have low nutritional value hence are only used to fill the stomach during dry seasons.

Forage production constraints

Table 30: *Bwisanga: Forage production constraints and their rank.*

Constraints	Rank	Affecting	
		Numbers(production)	Productivity
Prolonged dry periods.	2	Number decrease by 5 %	Reduced by 1/2
Land scarcity	1		Affected by 20%
Lack of knowledge in forage conservation	4	Numbers reduced by 5%	Affected by 15%
Absence of quality forage seeds.	3	Numbers un affected	Decreased by 30%

Coping strategies at times of forage scarcity

- Napier grass used throughout the year.
- Use of banana stem
- Use of crop residue and rice straw.

Feed supplements used

- Maize bran
- Rice bran
- Groundnuts residues.

Bwisanga: Conclusions and Recommendations

Conclusions

- The bulk of milk produced was sold locally to the neighbouring trading centre, local milk bars and restaurants.
- Losses due to milk spoilage are common due to unreliable market.
- No micro credit lenders in the village.
- Zero grazing is the main production system practiced.
- Napier grass is the only most widely used forage.
- Supplementation; farmers are limited to mainly using rice bran.
- Major constraints include inefficient A.I Programme, poor veterinary delivery services, inadequate animal feeds.

- No measures in place to conserve forage which is very essential for these farmers practicing zero grazing.
- No local Dairy cooperative but farmers recognise its importance.

Recommendations

- Farmers should be encouraged to form cooperatives to provide training, dairy support services like veterinary services, dairy inputs and connection to breeders outside the districts and to markets for milk.
- Need for milk cooling facility in the area.
- Training of farmers on feeds and feeding programmes during the various stages of production
- Capacity building of farmers in marketing intelligence

Organization of farmers around milk commodity

- Training of farmer in forage conservation techniques.
- Training and empowering A.I technicians or provision exotic bulls
- Training of farmer in simple rain water harvesting techniques
- General idea in herd health programmes such as tick borne diseases, and internal worms
- Majority of farmers produced at subsistence level and should be trained to take dairying as a business

References

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